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AMERICAN FOUNDATION FOR THE BLIND INC.

The Sight-Saving Review

Volume VI Number 1

March, 1936

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Eye Openers

Emanuel Krimsky, M.D.

EVERY doctor will recognize in this article questions which have been presented to him by patients in the course of his medical experience

NOTHING interests people more than a knowledge of the whys and wherefores of their own ailments; also close in their interests are the whats and hows of the ailments of their children, husbands and wives, relatives and friends. An effort has been made to assemble and answer some of the more common questions that the eye physician is asked by patients and their relatives.

Is There Danger of Eye Glasses Breaking and Causing Injury to the Eyes?

However possible such an accident might seem, strangely enough, it very rarely occurs. Many busy eye specialists have never observed such a misfortune. And the reason is not difficult to understand. Those who wear glasses instinctively value their eyes more than those who do not, and the slightest shock or fear will automatically bring a sudden closure of the lids with concomitant protection to the eyes. For those who are not reassured, it is a comfort to know that lenses may now be obtained which are made of non-shatterable glass. This being the case, it is quite needless for a mother to deny her young child the safe glasses.

Will I Always Have to Wear Glasses?

Those who really need glasses will probably always require them, and by trying to deny themselves such a necessity, they are merely postponing the use of a comfortable aid to vision to some

later date. More glasses are being worn now than in the past, not because eyes are more defective—for they are not—but because the modern human has applied himself to occupations requiring close vision, unlike the pursuits of his forebears who lived on the soil where close use of the eyes was seldom called into play.

While eyes should be re-examined about once a year for glasses, and oftener in cases where eyes change more rapidly, it does not necessarily follow that lenses must be changed. For, while in some persons annual or biennial changes of glasses may be required, in others the same lenses may serve faithfully for ten or fifteen years.

Not every person can be equally benefited by glasses. The eye trouble may be severe eyestrain reflecting a general bodily disease; or it may indicate one of the many diseases which attack the eye. Such a determination falls within the realm of the ophthalmologist. The need for frequent changes of glasses may point to something far more serious than refractive error. Diabetes is frequently responsible; or it may be kidney trouble, or hysteria, or some other ailment. The important point is that the remedy lies in looking for the source of the trouble.

Another question ophthalmologists often hear, is: "Will I outgrow the need of glasses?" Such a liberation does occur, not as a result of wearing glasses, but in spite of their use. It would have just as readily occurred if these persons had religiously shunned glasses when they really needed them. The need for glasses is based on deviation in the size or shape of the eyeball from the normal.

The question of tinted glasses for everyday use is one that has raised many controversies. While in a few instances such lenses may be recommended because of excessive sensitiveness to light of average intensity, they are quite objectionable to normal eyes because of the unnatural color stimulation they introduce.

Is Pus in the Eyes Dangerous?

One of the common afflictions of the eyes is pus discharge. It is probably correct to state that at some time in every person's life such a condition will have occurred. And yet one significant fact is often overlooked, namely, in not a few instances pus containing dangerous organisms may cause blindness. From the moment a

child is born, every doctor and every nurse is on the watch for this disturbing complication. Since the routine instillation of antiseptic drops in the eyes of every newborn infant has become a standing rule, it has become almost axiomatic that blindness from discharge in the eyes of the newborn is due to sheer neglect. The doctor who thinks of pus also thinks of germs and of a microscopic examination. Gonorrhea, for example, is extremely dangerous to the eyes, yet its discharge may look no more harmful than that occurring with ordinary "pink eye." It is not the discharge of pus which blinds, but the organisms, whose identification should be left to the trained eye doctor. Pus in the corners of the eyes is a very common disturbance among adults, and can be successfully treated.

Are Tobacco and Alcohol Injurious to the Sight?

As a rule, neither tobacco nor alcohol directly affect the eyes, unless they have first attacked the general health. And yet every eye specialist, and every book on eye diseases, give prominent mention to blindness of varying degrees of severity from the prolonged and excessive use of either tobacco or alcohol in certain susceptible persons. It is extremely important to recognize blindness from tobacco or alcohol because immediate and complete abstention will often restore vision, unless the case has progressed too far. Wood alcohol blindness is permanent and cannot be cured.

Are Circles Under the Eyes a Sign of Eye Trouble?

The eye specialist is not infrequently consulted to correct a worrisome darkening of the lower lids. Rarely, however, can such a condition be traced to poor sight or diseased eyes. From the standpoint of the physician, the best that can be said is that certain persons are so constituted that the veins underneath the skin have become more apparent because of too little fat in the skin to conceal them; or possibly there may be too much skin pigment. Of themselves, the circles mean nothing. If the family doctor has assured the patient that she is not anemic, that her eyes are healthy, and that her general physical condition is good, then she had better stop thinking about this variety of rings.

Is a Black Eye Serious?

Among children—and sometimes among our alcoholic brethren—a black eye is regarded with honor, in the same sense that German students honor a scar on the cheek as evidence of duelistic prowess. If such an outward discoloration represented the whole story, we might have reason to laugh it away. But the inexperienced can see only skin-deep. It may be that the large majority of these cases can well survive the ordeal, even without having to go to a doctor. But that a certain number of these black eyes also show, on more careful examination, either a fracture of the skull or a hemorrhage into the eyeball with almost sudden blindness, is not generally known. It would seem reasonable, therefore, to submit all these eye injuries to medical examination, to avoid any possibility of permanent harm.

What Causes "Pop Eyes"?

Abnormally prominent eyes do not indicate larger eyes than normal, but are caused by an outward pushing of the eyes from their sockets. The doctor observing such a disturbance thinks of various possibilities. While prominent eyes most often mean thyroid gland disease, the condition may also be due to a tumor or growth in the socket (orbital cavity). Or it may be due to pus or blood filling up this cavity and pressing the eyeball forward. The determination of the exact cause for this condition is of paramount importance so far as the eyes and general health are concerned.

Can You Correct a Drooping Lid?

Like other disturbances of the eye, the mere existence of such an anomaly is of only passing interest. To trace its cause is our problem, for then we are in a position to institute proper treatment. If it be due to syphilis, as it occasionally is, then treatment will often yield surprisingly good results. If the lid muscles require operation, we may here, too, expect beneficial effects. In other instances, the muscles of the lids may be so wasted that the person may find it impossible to see because the drooped lids cover the pupils. Even in such apparently hopeless cases, a novel device known as a crutch spectacle will hold up the lid and belie the cosmetic defect.

What Do Puffy Lids Mean?

The eye doctor is often consulted for puffy lids. Just as swollen legs may require a heart specialist rather than a foot doctor, so puffy lids are not as a rule indicative of eye trouble, but of some disorder which the family doctor should aim to discover before the patient decides to see the eye doctor. It may in one case be due to a harmless form of exaggerated hives, or a bee sting; or in another instance, to heart or kidney trouble. The want of blood may in some persons account for such a puffiness.

What Can Be Done About Styes?

Styes are annoying and often obstinate, for no sooner is one gone than another one may appear; and sometimes, in spite of what the doctor may do, they keep on reappearing like weeds in a garden. For all that, they are quite harmless. Styes can be helped, partly by the doctor and partly by improving the patient's system. Measures must be taken to prevent the pus from spreading to other eyelashes. Hence washing the eyes is forbidden. Proper antiseptic salves should be prescribed to counteract the existing infection; and the possibility of a run-down state or of some bodily disease, such as diabetes, should not be ignored.

Is Common Granulation of the Lids Dangerous?

Granulation of the lids is an annoying eye affection. It is popularly associated with a reddening or scaliness of the lid margins and often indicates a run-down condition, or a dietetic or skin disorder. In any case, it is never serious and can usually be easily corrected—provided the patient is willing to seek medical attention. Too often, the condition is neglected.

Among eye specialists, the term "granulated lids" may convey entirely different meaning—something more serious, but fortunately increasingly rare in the United States. I am referring to trachoma—a chronic disease of the lids often leading to blindness when untreated.

What Are Running Eyes?

We never think of the surface of the eye as being moist until actual tearing occurs. Normally, tears are pouring into every eye

from a gland, known as the lachrymal gland, situated beneath the upper outer eyelid. Were it not for the fact that this procession of tear drops automatically finds its way into the nose via a little opening on the lower inner lid leading into the connecting passage (lachrymal duct), tearing would become quite obstinate and annoying. The best proof of the patency of this passage is that when a person cries he often holds his handkerchief to his nose, really to wipe away the excess of tear drops which have escaped into the nose. When a person presents himself to the doctor for excess tearing, the latter makes sure that there is no clogging in any portion of this passage. In some instances, this connecting duct may be so clogged that the tears stagnate and produce a swollen abscess below the lower inner lid. When stretching of the duct is feasible, that is performed. In other instances, the duct may be too damaged to be saved, and this infected, swollen sac has to be removed—an operation that is not disfiguring or harmful in any way. In still other cases, the gland or source of the tears may be overproductive, and part of it must be removed. And in still other cases, it may be just a particle of dust in the eye that is causing all this trouble, or just a simple catarrh of the lids requiring proper medication.

What Do Spots Before the Eyes Signify?

When we find spots on a perfectly white illuminated screen, we naturally look for dust or specks in the projector. And if floating particles or spots are seen or projected by the human eye, we likewise look for particles which can often be clearly recognized by the eye examiner in some portion of the eye. In other instances, the "spots" in the visual field may be just as real and yet there may be no particles in the eye whatsoever because the condition is due to some disease in the eye, such as arteriosclerosis; or to no disease at all, but to a simple nervous disorder. The establishment of the cause is quite important for the patient, not only from the standpoint of preservation of vision, but also in giving one warning of a possible existing or oncoming bodily disorder. The average layman does not realize that the eye is often a mirror of bodily disorders, and that the competent eye physician always finds in an eye ailment the reflection of some other possible bodily disorder.

Does Eyestrain Cause Blindness?

What do we mean by eyestrain? If by eyestrain is meant excessive use of the eyes for reading, then no one can prove that even partial blindness can result from it. The only thing we can expect is a tired feeling in the eyes, and reddened lids. Nor are we to make the mistake of attributing eyestrain to the wearing of thick glasses, or to excessive use of the eyes, for if you will scan the reading public, you will find prolific readers who have never found need for glasses, and others who read little and still require periodic changes of their glasses. There is a form of eyestrain or eye fatigue due to an impaired state of health. Obviously, no glasses will fully correct such a disorder; a general toning-up of the system, with rest to the eyes, is the answer. Cross-eyes are sometimes confused with eyestrain. In fact, it is a common superstition to guard young children from performing funny gymnastics for fear that they may become eyestrained or cross-eyed. Here, too, clear proof is lacking. The term "eyestrain" is very rarely used among eye specialists, who aim to classify the very many eye disorders—all of which in reality must represent some strain to the eyes—into intelligible ailments.

Do Children Outgrow Cross-Eyes?

Cross-eyes is another eye disorder that is often laughed away by friends and neighbors and, I am afraid, by many parents, too. Some parents seek solace in the common superstition that their children will outgrow the cross-eyes, never realizing that a crossed eye may be a blind eye, for the reason that two eyes cannot see at the same time when they are not straight and one eye therefore becomes visually impaired in order to avoid disturbing double vision. That eye often gradually loses vision from disuse or inaction.

Another mistake parents make is to defer examination or treatment until the child is too old. Early attention is absolutely imperative, for the young child acquires his habits and incidentally adjusts his unstable eyes at this early period. Just as children must be broken of wrong habits when they are very young, so must their eyes be properly trained and cared for at this stage. Among eye doctors it is axiomatic that the younger the child, the more

certain the success; after the age of eight or nine, restoration of vision is difficult.

The management of cross-eyes is far different from the routine attention to other eye ailments, when it is primarily a case of drops or of surgery for which the eye doctor assumes full credit for success. Correction of cross-eyes is a process in education in which the full co-operation of the parents and the child is demanded in order to train the eyes into their normal position. The doctor is merely a supervisor or teacher who keeps a close watch on the homework of parent and child, and either assigns progressive training, or must decide whether surgery must be resorted to. A piano student can hardly become a finished pianist if all his training is done only during the course of a piano lesson. As in the case of the piano student, whose teacher cannot at once judge how promising his pupil will prove to be, so is it with eye training. Supervision must be patient and exhaustive and individual and fascinating; with such a course of procedure some children will prove promising, others will not. But no harm can be done, and surgery may well be postponed during this trial period.

What Can Be Done to Remove Particles from the Eye?

When something falls into the eye, we naturally rush to the corner druggist, for he has attended to these accidents when we were children, and possibly from time immemorial. It seems too trivial a disturbance to warrant an eye doctor. Besides, it would entail needless expense. And, as a rule, the druggist is successful; if he is not, the only one who would know that would be ourselves, for we should never rebuke a friend whose assistance was gratuitous. In spite of what I shall have to say, the corner druggist will probably continue wiping away dust particles from the eyes.

Can you picture a piece of coal or iron dust, not lodging on the lid, but becoming fastened onto the eyeball? Try to imagine a well-meaning druggist, without lens or light or equipment or sterile material, trying to rub a cotton applicator back and forth on the surface of a delicate eyeball, and possibly scratching it. Imagine the nervous patient moving his head and incidentally his eyeball against this applicator. I need not enlarge on this picture. And if you are still a confirmed believer in the druggist,

and have been relieved of a particle of dust, are you certain that there may not be another particle in the eye, as sometimes happens? Or it may be that a piece of iron may be unkind to you, and choose not to rest on the lid or eyeball, but to penetrate the eye without leaving any outward marks, as sometimes happens. This can be detected only by means of an X-ray picture. Wherever the foreign body may be, haste is imperative, for an eye cannot survive the invasion of an unfriendly visitor without suffering severely sooner or later. Not only that, but the unharmed eye may also suffer quite as severely as the injured one, out of sympathy for its fellow. Can you see how important it is to see what you are doing, especially when dealing with such a delicate organ as the eye? If the piece of iron is fastened on the eyeball, the eye must be anesthetized, and its removal must be painless and gentle; if it has perforated the eyeball, an electro-magnet will probably be needed, or complete loss of the eye may result. Thus it is easy to see how important it is that an eye physician be consulted from the very beginning.

What Is Glaucoma?

Glaucoma is one of the eye specialist's most serious problems. Other eye ailments may appear too obvious to an experienced physician, or may last a few days and be forgotten, or even if serious, may not lead to such suspense and lingering and alarm as dread glaucoma. Its gravity is enhanced when we realize that it may progress to complete blindness in spite of the most expert medical or surgical treatment. Neglect of the condition, however, hastens blindness which might otherwise have been completely checked, or slowed in its downhill progress.

Glaucoma is an abnormally increased hardening of the eyeball, brought about when the fluid, normally circulating in the eyeball, becomes blocked and imprisoned, and cannot escape. Hence, there results a congestion in the eyeball that mounts as more fluid seeps into it, until it would seem as though the eyeball would burst from this intense pressure. While such a rupture does not, as a rule, occur, the damage to the optic nerve and retina from this pressure may be severe, and the pain, even in the early cases, is bursting in character.

How does the doctor tell that an eyeball is hard or under pressure? If the case is marked, or even moderate, his fingers will not deceive him. If it is mild or early, an instrument (tonometer) applied to the eyeball will not only indicate a condition of hardness, but will also yield the exact pressure for record purposes. Other technical methods are also resorted to.

The tragic aspect of the situation is that the patient with early glaucoma never thinks about his eyes; his complaint is usually severe headache, one for which a druggist's medicine or an examination by the family physician would appear sufficient. What a common complaint—headache. If the patient were fortunate enough to have his doctor discover the existence of early glaucoma, when damage to the eye is still insignificant, how thankful he should be; for it is in just these early cases, which demand the most careful detection, that the greatest good may be expected. The treatment consists in giving something which will re-open the microscopically fine passages in the eyeball, and flush out the clogged fluid, thereby reducing the hardness. Certain eyedrops, under the careful control of the eye doctor, are often successful. In other cases, an operation is required.

However wonderful have been the advances in ameliorating this condition, and in understanding its structural nature, the real cause is still a mystery. For that reason, every case of glaucoma offers a distinctly individual problem. Whatever the nature of glaucoma, be it mild or severe, it cannot be too strongly emphasized that even though the patient may never again require any further treatment, he should regard himself as a chronic case in the sense of requiring periodic examination by his eye doctor.

What Can Be Done for Cataract?

Cataracts are loosely taken to mean any and all reasons for fogging or dimness of vision. While the fogging of almost any portion of the eye may lead to blurred sight, only one form can, strictly speaking, be considered "cataract"—the one due to fogginess of the lens of the eye. For the layman, such a distinction is especially important for the reason that the lens is particularly accessible for surgical operation, whereas other types of foggy vision either are amenable to some other form of treatment, or may not be helped at all.

Cataract is not so simple as it sounds, because its nature may forbid surgery. Then, again, whatever the ultimate outcome of a cataractous eye, its progress must be repeatedly observed while waiting for the ripe or mature stage to develop in order that the knife may do its intended good. Eye drops and various injections and even vitamin-containing oils have been recommended by some doctors as promising, but the real proof as to their intrinsic merit is still lacking. Cataracts do not develop uniformly, but vary much in the way they progress: some remain at a standstill in slight form for many years; others become rapidly mature; and still others clear up of themselves. And, finally, however ripe and ready for operation a cataract may be, a doctor may still hesitate to undertake surgery out of respect for the fellow eye which may prefer a fogged partner to one in which restoration of vision may have induced annoying discrepancies in the acuity of sight of the two eyes; or it may be that there is some underlying disease such as diabetes or syphilis where complications may be feared. And so, like glaucoma, the management of cataract is an individual problem but one which in properly selected cases offers an amazing measure of success and gratification.

Illumination Intensities for Reading*

Miles A. Tinker, Ph.D.

THIS is the second of a series of articles on illumination which the REVIEW is presenting to meet the inquiries of ophthalmologists, school officials, business and factory directors, and parents as to the problems of lighting

THE ordinary citizen is being made more and more conscious of the illumination brightness under which he uses his eyes both while working and in recreational activities. We find a wide divergence in the intensities of artificial light which are being recommended as most hygienic for the eye. It would seem, therefore, that this is an opportune time to make a critical analysis of the experimental data from which the conclusions concerning hygienic illumination intensities are derived. Perhaps the data are more consistent than the conclusions derived from them.

Reading is perhaps the most common form of visual work done under artificial lighting. Our discussion, therefore, will be concerned with the experimental foundations of hygienic illumination intensities for reading.[1]

The many experiments on the relation of visual acuity to intensity of illumination all yield highly consistent results.[2] The increase in visual acuity with rise in light intensity is very rapid from a fraction of one foot-candle up to about five foot-candles.† With further rises in intensity, visual acuity increases more and more slowly. Beyond 10 or 12 foot-candles the increases in acuity

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† A foot-candle is the brightness of light from a standard candle one foot away. For example, a 60-watt frosted bulb with the rounded end projecting toward the reading surface will yield 10 foot-candles of light at approximately 37 inches distance, 15 foot-candles at approximately 31 inches distance and 25 foot-candles at approximately 21 inches. If the lamp shade reflects some of the light downward the brightness at any given distance will be somewhat increased.

are hardly noticeable and beyond 20 foot-candles they have no practical significance.

The measurement of visual acuity involves, of course, discrimination of very fine details. The results of these studies, therefore, are ordinarily not readily applicable to the normal reading situation. Experiments which do pertain directly to the hygiene of reading are investigations of the relation of illumination intensity to visual fatigue and to efficiency of visual performance. It has been shown[1] that the decrease in ability to sustain clear seeing (fatigue) during continuous reading for three hours under well-diffused artificial illumination was marked when the light was one foot-candle or less, but at three foot-candles the ability to maintain clear seeing was as efficient as at higher intensities; that is, there was practically no change in visual fatigue at three foot-candles and over. When Atkins[3] increased the intensities of diffused lights by steps from 9.6 to 118 foot-candles there was no change in working efficiency in a short number-work test. Extensive investigations of the illumination in U. S. post offices[4] revealed that efficiency of letter sorting reached its maximum only when the light measured at least eight to ten foot-candles. Increases in efficiency were large when the illumination was varied from two to five foot-candles but only slight when varied from five to eight or ten foot-candles.

Luckiesh and Moss[5] performed an experiment which they call the most significant research so far reported in the invasion of the realm of psychophysiological effects of seeing and which they claim is mainly responsible for establishing a "new science of lighting."[6] They measured in grams the pressure changes in muscular tension at the finger tips while normal subjects read large (12 point) type under 1, 10, and 100 foot-candles of light. The mean pressures were found to be 63.2 grams for 1 foot-candle, 54.1 grams for 10 foot-candles and 43.0 grams for 100 foot-candles. Plotted on a logarithmic scale the differences between means *appear* large. No significant change in rate of reading appeared under the different intensities. From the data in this experiment the authors claim that "at least several hundred foot-candles would be the best intensity of illumination for this task which could be performed in full moonlight."[6]

A careful examination of the data in this experiment suggests

that the conclusions are not supported by the results. Tinker[7] points out that the data should be plotted on a linear rather than on a logarithmic scale. The results then show marked changes in pressure up to five or six foot-candles; gradual changes from six to eight or ten foot-candles, very small changes from 11 to about 25 foot-candles and practically no significant change thereafter. It seems obvious that all of the important changes in muscular tension occurred at relatively low illumination intensities. In fact, the revised curve for the data is very similar to curves expressing the relation between visual acuity and illumination intensities and no one has concluded from these that high intensities are desirable for reading. We are forced to reject Luckiesh and Moss's interpretation that slight changes in muscular tension at the higher intensity levels indicate that several hundred foot-candles are best for reading large black print on white paper.

The reader's choice of the brightness of light which he considers most comfortable for reading is held to be important. With well-diffused light, Luckiesh, Taylor, and Simden[8] found that the average reader preferred 5.3 foot-candles for reading text in 11- and 12-point type (large book type), and 10.6 to 16.1 foot-candles for text in 9-point type. For 9-point type of very poor legibility only 17.4 foot-candles were chosen when 30 were available. Somewhat later Luckiesh and Taylor[9] measured preferences for light intensities when subjects read text in 9-point type under well-diffused light. When 8 foot-candles were available the readers chose 4.2 as most comfortable; with 30, 10.6; with 45, 16.1; with 65, 23.2; and with 100, 35.8. That is, from one-third to one-half of the available intensity was chosen as most comfortable. In a more recent study Luckiesh and Moss[6] found that the median intensity chosen was 50 when up to 1,000 foot-candles were available. Why were higher intensities not chosen when they were available? It would seem that the adaptation of the eye is involved. Apparently the eye readily adapts itself to easy and efficient seeing at various intensities of illumination above a certain minimum. For ordinary reading by the normal eye this minimum seems to be approximately three foot-candles. Thus when the eye is subjected to a wide range of intensities the adaptation is apparently such that only a fraction of the available brightness is chosen as most com-

fortable for reading. Since the range of intensities available in most homes and offices is probably not less than eight and not more than 30 foot-candles, 4.2 to 10.6 foot-candles may be taken as representative values for preferred light intensities in these situations. Contrary to Luckiesh and Moss's statements[6] there is nothing in the literature to support the notion that the normal person reads with greater comfort under relatively high intensities of illumination.

There are situations, however, where high intensities of light are essential for hygienic vision: (1) the defective eye, even with corrective lenses, needs a brighter light than the normal eye. In like manner, the eye that is changing with age should work under relatively bright illumination. Ferree, Rand, and Lewis[10] found that normal eyes are little benefited by intensities above 10 foot-candles but that persons with presbyopic vision are greatly aided by intensities up to 100 foot-candles. Similarly it was found that increased light intensities improved near-point vision of presbyopic eyes but not nonpresbyopic eyes.[11] Probably intensity of light as well as correcting glasses should be kept in mind as one of the aids in presbyopia. (2) When print is of poor legibility or when discrimination of very fine details is required, light intensities should be relatively high.

It is well known that the relation between intensity and distribution of light in any seeing situation is extremely important.[1] If the illumination is uniformly diffused, the intensity may be increased to any desired level without harm to the eyes, but where the light is not well diffused, the higher intensities result in glare which frequently produces marked eyestrain. With the most uniform diffusion found in the average home or office it is probable that the light intensity should not be greater than about 15 foot-candles. Ferree and Rand[12] have devised a type of light unit which yields hygienic, glareless illumination with a wide range of intensities.

In the light of experimental data on the requirements of efficient and comfortable seeing, the following specifications for light intensities should fulfil the requirements of hygienic vision for the reading of legible print by the normal eye: three to five foot-candles with direct lighting and poor diffusion; five to ten foot-candles

with the combinations of direct and semi-indirect illumination frequently found in homes and offices; 10 to 15 foot-candles with the better degrees of diffusion found in a few homes and offices. If glare is eliminated, higher intensities may be employed without harm, but also without practical advantage. As specified above, for defective eyes, for the reading of illegible print, and for discrimination of fine details, light intensities should be much higher. Eyestrain will not be avoided, however, unless the light is adequately diffused at these higher intensities.

A survey of the evidence leads to the conclusion that there is nothing to justify the suggestion that 25 to several hundred foot-candles of light are essential for easy and efficient reading of legible print by those with normal vision. The data indicate that relatively low intensities are entirely satisfactory. In fact, if eyestrain is to be avoided, low intensities are necessary in situations where the diffusion of light is poor.

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Heredity in Relation to the Eye

Prof. H. Lauber

THE eye may be considered one of the best sites in which to study transmission of anatomical structure, physiology, and pathology from generation to generation

HEREDITY, a force determining and governing every living thing, including man, is one of the most obvious facts in nature. So it cannot be surprising that the eye is also subjected to it, just as other parts of the body are. The possibility, however, of very exact measurement and examination of almost all parts of the living eye enables the scientist to observe the force and pattern of heredity in so many respects that the eye may be considered as one of the best sites in which to study transmission of anatomical structure, physiological action, and pathology, from generation to generation.

A casual observer will notice that the color of the eyes is generally inherited from either one of the parents or from some more remote ancestor. Sometimes one finds that one eye has the color of the father's eyes, and the other the color of the mother's. On closer investigation, we frequently discover in the anatomical structure of the eye features found in the eye structure of one of the parents. The radius of curvature of the cornea and its irregularities are often repeated in the child with extraordinary neatness. The same applies to the diameter of the cornea and to the length of the globe. In consequence refraction is, to a large degree, determined by hereditary factors. This applies particularly to high myopia, a condition which may exist at birth and is apt to progress during the whole period of growth. Such conditions can be studied, especially with regard to the pathology of the eye. We almost all of us know families with numerous cases of shortsightedness.

Life-Span of Eye Inheritable

Cataract is another disease of the eye which seems to run in families. Cataract is an affection developing chiefly in old age, and must be considered as a sign of local senility. The term *local* senility is deliberately applied here because attentive observation shows that changes caused by old age may be very different in character, and certain changes may exist by themselves without any other symptoms. Such isolated signs of senility are extremely pronounced in certain families: in one, baldheadedness is a usual thing in old age, whereas members of other families have good heads of hair all their lives and even in very advanced years; in some instances, all members of a family grow grey comparatively young, but they do not lose their hair. Then, again, we witness the early loss of teeth as a family characteristic. These well-known facts prove that different parts of the organism may be especially liable to decay—we might say to local death—before the entire organism shows pronounced signs of a decline caused by age. Everybody knows that there exist longlived families, while in other families hardly anyone reaches the age of sixty. Just as the entire individual may be shortlived or longlived, so single parts of the organism can die early or survive very long. Shortlivedness may affect a part of the body not essential to life, as the eye.

One may observe in the eye local destructions due not to external influences, but to an innate disposition which develops at a certain period of life. Ophthalmologists are familiar, for instance, with the degeneration of visual cells in the macula, the part of the retina with which we see best and on which we try to focus any object we want to see distinctly. The destruction of this part of the retina makes reading impossible and diminishes the eyesight so considerably that it cannot pass unnoticed. Such a degeneration may appear at any age and frequently affects several members of the same family. The interesting fact is that it affects the members of the same family at the same age, which differs from family to family. The degeneration may set in before the age of 20 in one family, or between the ages of 40 and 50 in another; it may occur in some families only as a pronounced sign of senility. The disease is not rare in old age, but it has a tendency to appear

in several or even all members of a family at approximately the same age. These facts teach us that a certain group of cells in the eye possesses the faculty of living for a certain period of years, and of dying at a certain age. When the destruction of these cells takes place in old age, we are not surprised because we are used to seeing degeneration of different parts of an organism worn out by long use. Our attention is more frequently called to such defects when they occur at a comparatively early stage of life in otherwise apparently healthy persons.

Sex-Linked Diseases of the Eye

This tendency is not unique in the study of diseases of the eye. The German oculist, Leber, described a partial atrophy of the optic nerve which appears at a certain age in all or most males of a family, exceptionally also affecting females. Here, again, certain nerve cells degenerate at a given age: another case of local death.

There is also a congenital condition, color blindness, which is hereditary. It mainly affects males and is often passed on by healthy females to their sons. The transmission of color blindness has especially been studied: it is congenital and does not alter during life.

A very dangerous affection of the eye, glaucoma, is sometimes seen in several members of the same family, who tell us that in the preceding generation, or sometimes even in two or three preceding generations, glaucoma was common. Here it is not the affection of a small group of cells, but a disease condition extending to the entire eye, and most probably even beyond, though the symptoms are located in the eye. We know that the cases of glaucoma in the same family resemble each other very closely, a fact quite important for the physician in the treatment of the individual case.

Forewarned—Forearmed

Though by no means have all hereditary conditions of the eye been enumerated—on the contrary, only a few examples have been given—one may draw very interesting conclusions from them. We see that anatomical structure and physiological function are based upon heredity; consequently, disease conditions rest upon the same foundations. The knowledge of the affections and their

course in people related to the patient can form a very important indication for the physician. He will be on the look-out for developments in the course of an affection similar to those known from the history of other members of the same family. He may, therefore, apply preventive treatment in order to influence the condition favorably at its very outbreak. Predestination is met with in nature perhaps more frequently than we realize. One must, however, not become fatalist and conclude that it is unnecessary or hopeless to undertake the treatment of a hereditary affection. Because treatment of the patient can be started before he has reached the age in which his vital powers are exhausted, knowledge of the family history will even allow us to hope for recovery from severe diseases. Sometimes we see quite old people recover remarkably well from very serious and dangerous illnesses—their vital powers were sufficient to overcome the disease; on the other hand, one sees conditions, not generally considered dangerous, prove fatal to comparatively young persons. May it be well understood that the fact alone of belonging to a longlived, healthy family does not give one the license of trifling with one's health in a foolhardy way. By undermining it by unhygienic habits, (such as drinking, smoking and so on) and thus causing wilful injury, one can destroy even the soundest constitution. Predestination to long life will prove true only if life is not injured by too powerful counteraction. It is also very probable that members of shortlived families will live longer than the medium age if they comply with the rules of hygiene and live a healthy, active life. Early control of hereditary affections of the eye can, by systematic treatment, in many cases overcome disease tendencies and prevent or at least delay their progress.

Besides downright affections, there also exist congenital malformations of the eye connected with blindness or poor sight. The number of these cases is not large. Far more numerous are people afflicted with hereditary eye disease, for instance, high myopia which predisposes to severe ocular affections, such as degeneration of the macula or detachment of the retina. The condition of the eyes is, therefore, as far as transmission of diseases and predisposition to them is concerned, of great importance, as well from the individual as from the social point of view.

Squints and Squint Training*

James H. Allen, M.D.

TO correct cross-eyes treatment must be begun early and followed consistently

THE term squint is used to designate any of those conditions in which an individual's eyes are not straight. It may, therefore, refer to those cases in which a patient's eye may be turned up or down while the other eye remains straight, or to those in which one eye turns out while the other remains straight, as well as to those cases in which the eyes are crossed. For purposes of differentiating between the two eyes, the eye that remains straight is called the fixing eye and the eye that is not straight is called the deviating or squinting eye.

There are several types of squints, for instance that type due to paralysis of one or more of the muscles which control the movements of the eyes. This type of squint may appear any time during life as the result of injury or disease and forms only a small percentage of this affliction. There is another type, which is the result of disease or injury of the eyeball itself, producing a marked loss of vision or blindness, and, as the patient can no longer make use of this eye, he does not attempt to control its movements. This group, likewise, forms only a small percentage of the entire group of squints. The great majority of squints occur in childhood, making their appearance between the ages of one and six years, with the largest number of them developing before the age of four years. Thus, they occur at that period before the eyes have reached their full development, and arise as a result of faulty development. It is this group that we shall consider today, for it is this type which offers the best results from proper treatment.

* Address given before Public Health Section, Iowa State Association of Registered Nurses, at Davenport, Iowa, October 16, 1935, and reprinted with permission from *Public Health Nursing*, February, 1936.

The importance of treatment of this group of squints is found in the fact that the deviating eye rapidly loses vision and becomes blind when neglected. To remedy unattractive appearance and the prevention of the development of peculiar psychological reactions, such as an inferiority complex, are of secondary importance to the conservation of sight.

In order better to understand the mechanism of the development of this type of squint and the rationale of its treatment, let us consider normal eyes.

The Normal Eye

A normal adult uses both eyes all of the time in order to ascertain the position of various objects in space, and the relative distances between objects; in other words, he has a sense of perspective. He has this sense of perspective because, in looking at a particular object, he sees a slightly different portion of that object with each eye, or we may say that a slightly different image of the object is formed in each eye. Then the impressions of these images are carried to the brain separately for each eye, but the brain blends the two impressions into one picture thus producing binocular vision and depth perception. This ability of the brain to blend the two images into one picture is called the fusion faculty. We may say that binocular vision is dependent upon the presence of a fusion faculty, but in addition to this, the eyes and muscles which control the movements of the eyes must be normal.

At birth the fusion faculty is not present even in the normal infant. It is only at the age of about five or six months that one first finds any evidence of the beginning development of this sense, and it is not until about the end of the first year that the infant shows a fairly marked development of the fusion sense, or a fixed desire for binocular vision. During the first six months of life his eye movements, like most of his other acts, are purely reflex, and although the eyes move together to a certain extent, these movements are uncertain. During the second six months of his life the infant begins to use his eyes together, that is, he begins to look at objects with both eyes at the same time. At first he can focus both eyes on a single object only momentarily, but towards the end of the first year he will make a considerable effort to focus

both of his eyes on a single object, which means that he is showing a desire for binocular vision under the influence of the developing fusion sense. However, from a large amount of experimental data it has been concluded that the fusion faculty does not reach its full development until about the end of the sixth year of life.

The Abnormal Case

With this normal mechanism in mind, let us suppose we have an individual who has not developed a fusion sense, or whose brain is not capable of fusing the images of an object formed in each eye. This individual will then see double as long as he looks at an object with both eyes at the same time. In order to avoid this confusing state of affairs, he looks at an object with one eye and allows the other eye to turn away. This is probably the thing that happens when a child first begins to squint. We can say then, that the primary cause of the great majority of squints is the absence or failure of complete development of a fusion sense, for some squint patients do show some evidence of having a fusion faculty, but in these cases it is very weakly developed.

In the presence of this fundamental cause the eyes are in a state of unstable equilibrium ready to squint either inwards or outwards on slight provocation. This provocation may be supplied by any one of several secondary factors, the most important of which is poor vision in either one or both eyes. If the patient has good vision in one eye, he will look at an object with this good eye and allow the other eye to deviate. If the vision of both eyes is poor, the patient will fix with the eye that has the better vision and allow the other eye to deviate. Other secondary causes of squint are injury during birth, hereditary influences, and occasionally childhood diseases. Even though we frequently hear parents say that their child began to squint when he was getting over measles, we find that the primary cause, even in these cases, is a poor or undeveloped fusion sense. The child, in addition to that, nearly always has poor vision and during his convalescence he was given picture books to look at with the result that in his general weakened state he was unable to focus both eyes on the pictures, and so made use of the one eye with which he could see with the least effort, allowing the other eye to deviate.

In addition to provoking the appearance of a squint, the secondary factors generally determine the direction in which the deviating eye will turn. For instance, if poor vision is the provocative cause of the squint, the deviating eye will practically always turn inwards if the patient is farsighted. If the patient is nearsighted the deviating eye will, in most cases, turn outwards. Of these two causes of poor vision, farsightedness is, by far, the most common. Therefore, we would expect the majority of the squints to be convergent or have their eyes turned inwards. This is borne out by a recent survey of grammar school children in which 10,239 children were examined, and 253 were found to have squints. Of this number, only 22 children had eyes that turned out while in 231 cases the eyes turned in.

In order to understand better the importance of treatment of squint conditions, and particularly the importance of early treatment, let us follow the course of a typical untreated case. This hypothetical case, for which any number of examples may be found, has a poorly developed fusion sense, let us say, and is farsighted. During the first six months of his life the patient's eyes remain relatively straight from reflex movements. During the next six months he begins to develop a fusion sense and this keeps his eyes relatively straight during this period; although at times it may be noticed that one eye will turn in for a few moments at a time. During the second and third year of his life, he begins to take an increasing interest in objects that are near to him, such as picture books. These objects require the child to focus his eyes, and since we have supposed this child to be farsighted, he does not see objects near to him distinctly without additional effort or strain. Since his fusion sense is only poorly developed, it is not powerful enough to hold both of his eyes on the near object, and so the child looks at the object with the eye which he can focus easiest and allows the other eye to deviate. The direction of deviation in this eye is inward because in focusing the eyes on a near object the eyes, normally, turn slightly inward, and in this case the deviating eye turns farther in toward the nose as that is the easiest movement for it to make. During this period the squint at first is noticed only when the child looks at a near object and so may be called an occasional squint, but as this continues over a period of time, the

inward rotation of the deviating eye becomes habitual, being present even when the child looks toward distant objects, though it may be more marked when he looks at his picture books.

So far we have considered only the development of the squint, now for the consequences. The squint appears primarily because the child cannot fuse the images of the object. Even after the eye has deviated, the child has an image of that object formed in his eye and communicated to his brain so that at the onset of the squint the child probably sees double. However, with the eye turned to one side, the image communicated from that eye to the brain is not very clear, thus making it easier for the brain to disregard or suppress that image. Now add to the effect of turning the eye away from the object, the blurring effect which is the result of the child's poor vision and it is still easier for the brain to suppress the image. As the squint becomes more marked, the suppression increases and as the deviating eye is not being used it becomes blind. This blindness from disuse appears quite rapidly after the onset of the squint and, as a rule, is more rapid and more severe the younger the child when his squint appears. For instance, if a squint appears in a six to eight-months-old infant, he has a marked degree of blindness in eight to ten weeks, whereas the same degree of blindness may require a year to develop in a child who first begins to squint at the age of three years. This situation is all the more deplorable when we consider that with adequate early treatment the blindness in most of these cases may not only be prevented from becoming worse, but also the vision may be partly or completely restored.

Treatment

This brings us to a consideration of the treatment of these cases. The objectives of treatment are: first, and most important, to prevent deterioration of the vision of the deviating eye, and to restore, as far as possible, the sight of this eye in those cases in which blindness from disuse has already been allowed to occur; second, to endeavor to remove the fundamental cause of the squint by training the fusion sense at the earliest possible age; and finally to straighten the eyes.

The methods of attaining these objectives may vary somewhat in the various squint clinics, but the fundamental principles are the same, so we shall discuss the methods employed in the clinic at the State University of Iowa Hospital.

After we have obtained a history of the case, our first step is to determine how much the patient can see with each eye. With children of school age this is done with the usual alphabet and numeral charts, but for younger children we use charts that have pictures of dogs, cats and rabbits of graded sizes in place of the letters. For even younger children, we use graded sizes of white marbles which are rolled out to a distance of twenty feet and the vision is estimated by the ease with which the child locates the marble at that distance.

After having determined the vision, our next step is to fit the child with glasses. This is done by putting drops in the eyes and measuring them with a special instrument, which not only tells us the strength of glasses needed, but also whether the child is near-sighted or farsighted.

As soon as the glasses have been made for the child, they are put on him and the vision is again determined for each eye. If the vision now is found to be fairly good in each eye, the child is started at once on training to develop the fusion sense, but if the vision in the deviating eye is still poor, the next step is to attempt to build up the vision in that eye. We generally attempt to do this by blindfolding the good eye, making the child do all of his work with the poor eye. When the good eye is blindfolded, the child is generally listless and upset the first day, but on the second he goes about the ward and does his work in a normal manner. Because of this reaction to blindfolding the good eye, we feel that the best results are obtained only if that eye is blindfolded all the time. We keep the good eye blindfolded for varying lengths of time, checking the vision in both eyes at three to four-week intervals. This is done because we must not allow the vision in the blindfolded eye to fail from lack of use, even though the vision in the other eye is improving.

When the vision in the deviating eye has reached its maximum improvement, we attempt to develop the fusion sense. The instruments used in this type of training are merely modifications or im-

provements upon the simple stereoscope that used to adorn so many parlors. At first the instrument is adjusted to the angle of squint as it then exists, and simple charts are used to create an involuntary desire for fusion. One of the first sets of charts used has a bird on one chart and a cage on the other. The instrument is adjusted so that the child sees the bird in the cage. Then he is shown that, by altering the instrument, the bird can be made to go in and out of the cage. He is then taught to keep the bird in the cage while the instrument is being changed. When he can do this easily, he is given increasingly difficult problems of fusion until he has developed full binocular vision.

Early Treatment Essential

The results of this type of training depend largely upon two factors, first, the age of onset of the squint, and second, the length of time that has elapsed between the onset and the time that the child is brought to the clinic for training. In young children who are brought to the clinic shortly after the onset of the squint, glasses may be all that is required to allow the fusion sense to develop, but as the duration of the squint increases, the deviating eye loses vision and the full course of training must be used. If the child should reach an age of four or five years before the squint appears, he does not lose vision in the deviating eye as rapidly as the younger child, but here, also, the sooner the child is started on adequate treatment, the better the ultimate result and the shorter the period of treatment.

However, there are some children who do not respond to fusion training even though their vision has improved to normal by glasses and training. In these children the squint remains the same in spite of training, or it may change to the so-called alternating type of squint in which the child looks at an object with one eye at one time, and with the opposite eye at another time. The only course left in these cases is to straighten the eyes by operation. This, as you probably know, consists of changing the position of one of the muscles that control the movements of the eye so that the eye is swung around into a straight position. The straightening of an eye occasionally may be accomplished by one operation, but two or more operations may be required in some cases.

At this point it might be well to mention some misconceptions that seem to be fairly common among parents. One is that their child is too young to wear glasses, or can not be tested for glasses because he can not read letters. There is no child too young to wear glasses if he needs them, for special frames have been designed so that glasses can be kept in place even on an infant's eyes. Furthermore, it is not necessary for a child to know letters in order to be tested for glasses, for we use a special instrument to measure the child's eyes, and the only thing he has to do is to look at a light on the instrument. Another misconception is that a child may "grow out" of a squint. This is probably based upon the fact that during the first year of life every baby's eyes cross momentarily at various times, but by the time he is one year old, the normal child no longer does this. Furthermore, it is true that a squint occasionally becomes slightly less marked as a child reaches puberty, but by that time the deviating eye is hopelessly blind so that he has to pay a very high price for the small chance of "growing" out of a squint.

Conclusion

In conclusion, it has been the purpose of this discussion to bring out some of the features of that group of squints which embraces the majority of cases and which offers good results from adequate early treatment. These features may be summarized briefly as follows:

1. The majority of this type of squints appear between the ages of one and six years, with the largest number occurring before the fourth year of life.
2. This age incidence corresponds with the period in which the fusion faculty develops normally.
3. The squints develop primarily because the patient either fails to develop or only partially develops a fusion faculty.
4. The most important secondary or contributory factors in the development of this type of squint are poor vision and heredity. The poor vision may be due to farsightendess, nearsightedness, or astigmatism.
5. Once an eye begins to deviate, the patient disregards the images formed in that eye, and blindness develops from lack of use.

6. Blindness from disuse develops more rapidly the younger the child when the squint first appears.
7. The objectives of treatment are:
   a. To prevent blindness from disuse in the deviating eye, or to restore sight if blindness has already developed.
   b. To develop the fusion sense.
   c. To straighten the eyes.
8. Best results are obtained by adequate early treatment.

Eye Health Primer for Nurses

Francia Baird Crocker, R.N.

AN outline on eye health for the guidance of nurses—whether school, public health, private duty, or hospital nurses

EVERY nurse is the guardian of innumerable eyes, regardless of her special field of interest. The student of nursing; the institutional and private duty nurse; the public health nurse, engaged in school, industrial or visiting nursing—each should know how to protect well eyes to keep them well. When there is deviation from normal the nurse should recognize the need for prompt and competent ophthalmological care for those persons for whom she is in any way responsible. The nurse who understands how to protect and care for the eyes can render an invaluable service by teaching others how to safeguard their eyes.

Through the eyes the majority of the sense impressions are received. Sight is, therefore, the most valuable of the special senses; the importance of safeguarding and conserving this precious faculty cannot be overemphasized. Growth and development are influenced by eye health. Selection of occupations and achievements in them may be largely dependent upon eye health. Eye health, in turn, may be influenced by general health. To safeguard this very important sense, nurses need to know that the conservation of sight and the prevention of blindness begins long before birth and continues throughout the span of life.

If the eyes are to function to the best advantage, the following conditions are important:

1. Both eyes working in co-ordination and free from disease or defect.
2. Essential physical surroundings for using the eyes with comfort and efficiency.
3. Unobstructed avenues of approach to the visual centers of the brain and ability to interpret the message received by the brain.

If the eyes fail to work in co-ordination, usually there is a loss of efficiency in seeing. Disease or defect of some part of the eyes may impair vision by interfering with the formation of a clear image or by obstructing the message on its way to the brain. The visual area may be so impaired that it is incapable of functioning.

I. Prenatal and Postnatal Care

Why Is It Necessary to Emphasize Early Prenatal Care?

Adequate health measures during the prenatal period are as important to eye health as to general health. Attention should be directed to:

> Securing optimum nutrition for the expectant mother; physical examination, including an eye examination, for early detection of disease; and the necessary treatment.

How Does Syphilis Affect the Eyes?

Numerous eye diseases may be due to syphilis (congenital or acquired). Chief among these are:

1. Interstitial keratitis, which is an inflammation of the cornea and often permanently impairs vision.
2. Inflammatory conditions of the uveal tract, which is composed of the iris, ciliary body, and choroid.
3. Optic atrophy.

These conditions are responsible for a large percentage of the blindness among 114,000 blind persons in the United States.

To insure a healthy baby, free from syphilis, a complete examination, including laboratory tests in the first weeks of pregnancy, is necessary to determine whether the expectant mother needs treatment. The earlier treatment is begun for the expectant mother the better is the chance for the baby to be born free from syphilis.

Does Your State Require the Use of a Prophylactic in the Eyes at Birth?

If the use of a prophylactic is required, does it apply to: all births; midwives only; physicians only; hospital and maternity homes only; patients with suspected infections only; or is it waived if parents object?[1]*

Are All Infections at Birth Due to Gonorrhea?

Approximately more than half are due to this infection. The rest are due to infections by some other organism present in the

* Footnote numerals refer to items in the Supplementary Notes, p. 47 ff.

birth canal.[2] A prophylactic in the eyes at birth is important in reducing the number of all birth infections of the eyes.

What Can a Nurse Do to Prevent Birth Infections of the Eyes?

She must help in educating each expectant mother to insist on the use of a prophylactic in the eyes of her baby at the time of birth in order to guard against all infections. If a known gonorrheal infection exists, or the expectant mother has a vaginal discharge from any cause during the prenatal period, the nurse should route the expectant mother for examination and encourage her to remain under treatment as long as necessary in order to lessen the danger of infecting the eyes of the baby at the time of birth or afterward.

Among Children, Which Eye Conditions May Be Considered as Congenital and Hereditary as to Cause?

Disturbances in foetal development may result in: cataract, abnormalities in the size of the eyeball (megalophthalmus, microphthalmus), aniridia (absence of the iris), albinism (lack of pigment), retinitis pigmentosa (progressive pigmentary degeneration of the retina).[3]

Although some of these congenital abnormalities may be caused by malnutrition or disease, many are hereditary in nature. Attention should be focused upon the risk involved in enlarging families in which there is a hereditary tendency to any of the above conditions.

II. Testing of Visual Acuity

What is Meant by Testing of Visual Acuity?

The testing of visual acuity is a means of determining acuteness of central vision in each eye.[4] It is the most common method of detecting deviations from normal. By using this test it is possible to find many persons of all age groups who are in need of examination by an ophthalmologist. However, there are some significant eye conditions which do not affect central vision. For these, other signs of departures from normal must be sought.

In Addition to the Test, What Observations Can a Nurse Make?

Objective Inspection

1. Even though the central visual acuity is found to be within the range of normal during the test the nurse can observe evidences suggesting visual difficulty, such as: abnormal posture of head or body during the test, frowning, an

obvious effort to see the chart during the test, and eyes filling with tears.

2. The nurse may include in her inspection: observation of the lids and the lining of the lids and note any deviation from normal, as unusual redness, swelling, or discharge; shape of the iris and pupil; and whether or not the two eyes are working together.

Subjective Evidences

Complaints of blurring of vision, double vision, headaches, eyes hurting when reading or using the eyes for close work.

The nurse should be well acquainted with the appearance of the normal eye. When any of the above evidences are presented, she can recognize, within certain limitations, deviations from normal and can advise prompt and competent ophthalmological examination.[5]

When Should the First Test of Visual Acuity Be Given?

A vision test should be part of the health examination of every preschool child if eye difficulties are to be discovered and to be corrected before the period of school life begins.[6]

What Kind of Test Chart Can Be Used?

The Symbol E chart.[7] This chart is scaled according to Snellen measurements. The scale of Snellen measurements is approved by the Section on Ophthalmology of the American Medical Association. The characters on the chart are equal in visibility, and the chart can be used for children who do not read and those who do not hear.

Can the Same Chart Be Used for Children of School Age and Where May the Chart Be Secured?

Either the Symbol E chart or the Lines of Letters chart, drawn to the Snellen scale, may be used.[8] Several optical supply companies publish the Snellen Lines of Letters chart, fewer companies publish the Symbol E chart. Both charts may be secured from the National Society for the Prevention of Blindness.[9]

How Much Illumination Should Be Directed on the Test Chart?

Approximately 10 foot-candles[10] of illumination, either from a natural or artificial source and free from glare, has been found to be an acceptable level. Through research and experimentation, Ferree and Rand[11] of Johns Hopkins University have found this

amount of illumination to be acceptable for the purpose of testing for visual acuity. An intensity of more than 10 foot-candles of illumination, by giving compensation for possible defects, tends to eliminate many persons who should be referred for examination, while an intensity of less than this amount tends to include many persons not in need of further examination.[12]

III. Deviations From Normal

What are the Most Common Eye Difficulties Found Among Children?

1. Errors of refraction of various degrees and seriousness. (See page 47 for description.)
2. Failure of the two eyes to work together arising from a variety of causes and generally referred to as strabismus or squint.
3. Eye diseases affecting the different parts of the eye.
4. Congenital and hereditary eye defects.

Any of these conditions may impair visual acuity but all of them do not fall within the group of eye difficulties leading to blindness. Many of these eye difficulties are closely related to diseases affecting the general health.

Why Do the Two Eyes Sometimes Fail to Work Together?

Ophthalmologists are not entirely in accord as to the classification which should be made regarding the underlying cause or causes of this deviation from normal. Some of the significant factors of practical value in understanding why the two eyes may fail to work together are:

1. Relationship of the two eyes is sometimes disturbed due to a difference in the state of refraction of each eye.
2. At birth there may be imperfect vision in one eye.
3. There may be a deviation from normal of the muscles which control the movements of the eye as: lack of muscle tone, defects in the size and insertion of the muscles, or a paralysis of the muscles of the eye.
4. The fusion faculty[13] may be lacking or fail to develop perfectly.
5. Eye disease or injury may be responsible for the failure of the two eyes to work together.

One or more of the conditions mentioned above may be responsible for the failure of the eyes to work together.

When the Two Eyes Fail to Work Together What Can Be Accomplished by Treatment?

After the cause has been determined by means of complete eye examination it is possible for the ophthalmologist, in some cases, to improve and conserve vision through adequate treatment and proper glasses. From the nurse's standpoint the most significant points to remember in regard to treatment are:

1. The kind of treatment and its effectiveness are dependent upon the cause.
2. The cause can be determined only by means of a complete and competent eye examination.
3. Faithfulness in carrying out treatment is essential for the best results.
4. Special effort should be made to secure treatment for the preschool child. The earlier treatment is secured the greater the chances for improving vision. Every child should be given an opportunity for beginning school life free from a visual handicap which may seriously retard his school progress.

What Are the Most Common Causes of Blindness Among Children?

According to a recent study[14] these causes may be given in percentages as follows: infectious disease, 28.6; neoplasms (tumors), 2.2; traumatic and chemical injuries, 7.8; toxic poisoning, .1; non-infectious systemic diseases, 1.2; congenital and hereditary, 51.1; unspecified etiology, 9.0.

Classified in another way the most common causes are diseases affecting: the eyeball, 31.0; cornea, 14.4; iris and ciliary body, 2.2; crystalline lens, 17.1; choroid and retina, 14.4; optic nerve, 16.7; vitreous humor, .3; and miscellaneous, 3.9.

What Are the Most Common Causes of Blindness Among Adults?

Figures are not available for classification of causes as given above for causes of blindness among children, but the following are the most frequent conditions found to be responsible for blindness among adults:

1. Cataract
2. Optic atrophy
3. Glaucoma
4. Corneal ulceration
5. Uveitis
6. Choroiditis
7. Chorioretinitis
8. Retinal degeneration

What Is the Relationship Between Eye Health and General Health?

Conditions affecting the general health may in turn affect the eyes. A few of these are: nervous disorders, focal infections, tuberculosis, syphilis, hypertension, acute infectious disease, disorders of metabolism, and brain tumors. Some of these conditions may be manifested by eye difficulties before the underlying cause in the general health is found. When this occurs prompt recognition and treatment are necessary if vision is to remain unimpaired or partially preserved.

IV. About Glasses

What Should a Nurse Know About the Use of Glasses?

1. Glasses are worn to overcome errors of refraction, enabling an individual to see better and relieving the eyestrain and the nervous strain which may result from the effort to see where the vision is defective.
2. They are usually necessary as a part of the treatment plan when the two eyes are not working together.
3. After various eye diseases the glasses or a change of glasses may be necessary.
4. An example of a very important use of glasses is after an operation for the removal of a cataract in which the lens of the eye is removed and a substitute lens in the form of glasses must be supplied.
5. In middle life when physiological changes occur in the eyes, glasses are usually required for any close work.
6. Glasses are used for protection in certain industrial occupations.[15]

When Are "Drops" Used in the Eyes in Testing for Glasses?

The majority of ophthalmologists advise the use of drops in testing the eyes of children and young adults and for those older persons who are unable to co-operate with the ophthalmologist during the examination. By using drops the eyes are placed in a state of rest and the results of the test are not influenced by the individual's ability to bring his accommodation effort into play.

With the use of drops in the eyes the ophthalmologist is able to observe the internal parts of the eye and detect the presence of disease. This is particularly important if early evidences of disease are to be noted, as often there are changes within the eye not evident to the person himself until after it is too late to prevent serious or permanent impairment of vision.

What Are Some Additional Facts About Glasses and Their Care?

1. Each person should have glasses properly fitted according to his eye difficulty, shape and size of his head, and the position of his eyes.
2. Glasses need to be kept clean and properly adjusted.
3. The time for re-examination of the eyes should be determined by the ophthalmologist. If there is a progressive eye condition frequent, examination will be indicated.
4. No general rule applies regarding the use of glasses. Some individuals need to wear glasses at all times, others only for certain eye tasks. Some individuals need fairly frequent changes of glasses, others infrequent changes. Some individuals must wear glasses throughout life, others may be able to discard their glasses. Each case must be decided by the ophthalmologist upon the basis of the individual's need.

V. Comfortable Eye Environment

What Are the Essential Physical Arrangements for Eye Comfort?

Adequate illumination, whether natural or artificial, should be well distributed, and free from glare. The amount of illumination must be determined by the type of work or recreation for which it is needed, and by the visual powers of the individual. The source of illumination should be outside the range of vision. The bulletins listed in the Supplementary Notes emphasize lighting.[16]

Does Reading in Bed Harm the Eyes?

If the proper posture is maintained, adequate light is supplied free from glare, and attention is given to the selection of the size of the type and the character of the paper upon which the printing is done, reading in bed is not harmful to the eyes. Reading in bed during an illness should not be encouraged even with the physical arrangements mentioned above, except with the consent of the physician. After a serious illness special attention should be directed to the protection and care of the eyes. During convalescence the delicate structures of the eyes may be damaged through misuse and overwork.

VI. Eye Accidents

What Are the Causes of Eye Accidents Among Children?

1. Weapons: air rifles, shot guns, blank cartridges and cap pistols, slingshots, arrows, stones, tear gas guns.
2. Fireworks: firecrackers, torpedoes and bombs.

3. Explosives: gunpowder and dynamite.
4. Sharp pointed objects: knives and scissors, nails, sticks, wires and hooks.
5. Flying particles: chips of steel, wood, glass, and other objects.
6. Games and sports: baseballs and bats, golf clubs and balls, fishing, swimming, spinning toys.
7. Automobile accidents.
8. Burns: chemicals and hot objects.[17]

If an eye is injured, especially in the case of a penetrating wound, nurses need to be aware of the danger of sympathetic ophthalmia developing in the other eye. Prompt, skillful care of any eye injury and continued eye observation are of utmost importance. Sympathetic ophthalmia may develop in the uninjured eye several weeks or even months after the original injury.

It is not always possible to avoid all eye hazards and education in thinking *safety*, and playing *safely* is the only ultimate protection for children.

What Are the Accident Hazards in Industry?

Flying chips of metal, mineral, or wood; splashing liquids, molten metal, acid or injurious chemicals; exposure to excessive radiated heat; and explosions of endless variety.

Nurses can encourage managements to equip workers with protective equipment. Safety equipment manufacturers and optical companies are always glad to advise the proper kind of equipment necessary for a particular occupation. In the purchase of goggles, head masks, respirators, etc., care should be taken that they conform to the requirements set forth in the "National Safety Code for the Protection of the Heads and Eyes of Industrial Workers."[18]

What Constitute Other Eye Hazards in Industry?

1. Uncorrected errors of refraction, and eye diseases which impair vision.
2. Spreading eye infections through disregard of sanitary practices.
3. Incompetent and dangerous first-aid measures in cases of eye injuries.
4. Inadequate and poorly adapted illumination for the occupation especially from the standpoint of eye comfort and efficiency.

Every industrial nurse should know and teach the value of protecting the eyes by means of safety devices; insist upon prompt

medical attention and extended care in cases of eye injuries; secure correction of eye defects; build up standards for general health; and promote activities for improving sanitary conditions affecting eye health.[19]

VII. Partially Seeing Children

What Can Be Done for Children Who Are Not Blind but Who With All Possible Correction Have Impaired Vision?

In many regular school systems there are classes for partially seeing children. They are known as "sight-saving classes" or "sight conservation classes." Where no classes are provided special educational aids can be provided for each pupil. Only those children are referred who, in the opinion of the ophthalmologist, may be benefited by such educational aids.[20]

How Can Nurses Assist with This Group of Children?

Although it has been estimated that approximately one child in five hundred of the elementary school population has seriously impaired vision, only about 5,000 children have been given assistance through special educational aids. Nurses need to know which children should be given the benefit of such assistance.[21]

Have You Learned

1. Why prenatal care is important for eye health?
2. About the care of the eyes at birth?
3. Something about testing for visual acuity?
4. Regarding the care of the eyes of preschool and school children?
5. Safeguarding the eyes during play?
6. Protecting the eyes in industry?
7. Adapting the physical environment for eye comfort and efficiency?
8. Conserving sight and preventing blindness through proper care when deviations from normal appear?

VIII. Explanation of Some of the Eye Conditions Which Frequently Cause Blindness

Term	Part of Eye Involved	Cause	Explanatory Notes
Cataract	Lens or lens capsule	A cataract may be congenital or senile and, in addition, may be due to any of the following: trauma, ocular disease, general disease, and occupation.	When a cataract is present from any cause, there is an opacity of the lens or the capsule of the lens. The extent of visual impairment depends upon the location and the degree of opacity.
Choroiditis	Choroid	Most frequently caused by acquired or congenital syphilis, tuberculosis, and focal infections from oral and nasal cavities.	The choroid, dark membrane, forms the middle coat of the eye and serves as an organ of nourishment for the other parts of the eye. Any disease of the choroid may affect the neighboring structures which are: the retina, iris, optic nerve, vitreous, sclera, and lens.
Glaucoma	Eyeball	Unknown.	Glaucoma is characterized by an increase of the tension within the eye. It may be primary or secondary to some pre-existing disease. It is a common eye disease and occurs usually in the eyes of persons past middle life, but may be found in children. The latter form is called congenital glaucoma, or buphthalmus. It always impairs vision and constant ophthalmic care is necessary to conserve the remaining sight. It ranks high in the causes of blindness and frequently it is not detected until after the vision is permanently impaired.

VIII. Explanation of Some of the Eye Conditions Which Frequently Cause Blindness—(*Continued*)

Term	Part of Eye Involved	Cause	Explanatory Notes
Iritis	Iris. Iritis frequently involves the ciliary body and is then called iridocyclitis.	Focal infections, syphilis, tuberculosis, gonorrhea, acute infectious disease, diabetes, result of injury, cause not always known.	It is necessary to treat the underlying cause as well as the eye condition. If tuberculosis is the cause, injections of tuberculin are usually part of the treatment, as well as general treatment for tuberculosis. If syphilis is the cause, anti-luetic treatment is advised. In the case of focal infections removal of the cause of infection is part of the treatment plan. Vision may be greatly impaired.
Keratitis, Phlyctenular	Cornea. If conjunctiva only is affected it is then called phlyctenular conjunctivitis. If it occurs at the limbus (the place where the cornea and conjunctiva join), it is called phlyctenular kerato-conjunctivitis.	Tuberculosis and poor general health.	Tuberculosis is the most common cause; it usually occurs in children, particularly those children whose general health is poor. Because ulcers form as a result of the inflammatory condition vision may be impaired due to the resulting scars of the cornea.
Keratitis, Interstitial	Cornea, but may also affect entire uveal tract.	Usually due to congenital syphilis. May be due to acquired syphilis.	Most frequently occurs before the age of 15. Vision is apt to be seriously impaired as the inflammatory process often leaves dense opacities of the cornea.

Optic atrophy	Optic nerve	Primary optic atrophy may be due to syphilis, diabetes, affections of the brain. Secondary optic atrophy may be due to other eye diseases as: glaucoma, retinitis choroiditis. It may be hereditary. Injury may also be a contributing factor.	In case of primary optic atrophy blindness usually results. In secondary optic atrophy there is a better prognosis. Vision may be impaired, but complete blindness may not result.
Retinitis	Retina, and usually extends to optic nerve and choroid	May be primary or secondary with the following general causes: diabetes, syphilis, nephritis, trauma, etc.	General treatment of the underlying cause is of greatest importance.
Retinitis pigmentosa	Retina	Hereditary	Vision is progressively impaired and treatment is of little avail.
Retinal detachment	Retina	May be due to injury, and to ocular diseases.	Surgical treatment for reattachment is frequently effective. Early diagnosis is an important factor in prognosis.
Tumors	Choroid, retina	Unknown.	An ocular tumor may involve the brain. Prompt treatment is imperative and many times radical treatment, as removal of the eye.
Uveitis	Iris, ciliary body and choroid.	Essentially the same as the causes of iritis.	Loss of vision or serious impairment are the rule rather than the exception.

IX. Errors of Refraction*

Term	Part of Eye Involved	Cause	Explanatory Notes
Astigmatism	Cornea, lens	Deviation from the normal in the curvature of the cornea, lens or both. May be hereditary or congenital.	In general astigmatism can be described "without a focal point."
Hyperopia	Eyeball	Deviation from the normal shape of the eyeball (which is too short). Deviation from normal in the curvature of the refracting surfaces or in the refracting media. One or more of these conditions may be responsible.	The common term is farsightedness.
Myopia	Eyeball	Deviation from the normal shape of the eyeball (which is too long). Deviation from normal in the curvature of the refracting surfaces or in the refracting media. One or more of these conditions may be responsible.	The common term is nearsightedness.
Presbyopia	Lens, ciliary muscle	Chiefly due to loss of normal elasticity of the lens,	This is a condition due to a physiological change in the eyes of persons past middle life. It is manifested by a loss of accommodation for near vision.

*The term error of refraction is used to designate the condition which results from any interference of the rays of light which normally should enter the eye in such a way that they are brought to a focus on the retina.

It is important for the nurse to know that practically all eyes are hyperopic or farsighted at birth. Along with the physical development in general, there is an elongation of the eyes throughout the period of growth, which continues until the normal state of the eye is reached, permitting the rays of light to focus images perfectly on the retina. If elongation is continued beyond what is normal the rays of light entering the eye are brought to a focus in front of the retina instead of on the retina where they must focus if a clear image is to be formed. This condition is known as myopia. If elongation stops before the eye reaches normal shape, the rays of light entering the eye, if extended, would be brought to a focus behind the retina. This condition is known as hyperopia.

Not only must the eyeball be normal in shape to bring the rays of light to a focus on the retina but the refracting surfaces and the refracting media must be free from defect. The refracting surfaces are the cornea and the anterior and posterior surfaces of the lens. The refracting media are the aqueous, the lens substance and the vitreous.

An error of refraction may be the same in each eye. It may vary between the two eyes, and hyperopia may be present in one eye and myopia present in the other eye. When the error of refraction is the same in each eye it is possible to have a different degree of error in each eye. Both myopia and hyperopia may be complicated by the presence of astigmatism. If astigmatism is present the condition is then known as hyperopic astigmatism or myopic astigmatism depending upon whether the eyes are myopic or hyperopic.

The degree of error of refraction may change due to disease, injury or developmental changes, the latter occurring more or less throughout the whole period of life.

The science of physiological optics is extensive and only a brief introduction to the subject can be given here. It is important for the nurse to remember that the kind and degree of error of refraction and the correction of that error of refraction are dependent upon several different factors as indicated above.

Supplementary Notes

1. *Prevention of Blindness in Newborn Babies. No. D63. Indicates the practices of health departments, maternity hospitals, and medical schools in the United States and Canada.

* These publications may be obtained from the National Society for the Prevention of Blindness, Inc., 50 West 50th Street, New York, N. Y. Nurses may secure single copies free, with the exception of No. 6 and No. D77. These are longer publications and there is a small charge for them.

2. Organisms in addition to the gonococci which may be responsible for eye infections at birth (ophthalmia neonatorum) are: pneumococci, bacterium coli, staphylococci and streptococci.
3. A study of children in schools for the blind shows that slightly more than 50 per cent of the children are blind as a result of a transmissible condition. Berens, Conrad, Kerby, C. E., and McKay, Evelyn C.: The Causes of Blindness in Children, *Journal of the American Medical Association*, 105: 1949–1954, December 14, 1935.
4. Central visual acuity means ability to recognize distinctly the form of an object in the direct line of vision. Field or peripheral vision, on the other hand, is the awareness to perceive the mere presence, motion, or color within the field of vision. The former utilizes the area of the most acute vision of the retina. This area is called the macular area of the retina. The field or peripheral vision utilizes the remaining area of the retina which is not capable of distinct vision.
5. Any inspection made by the nurse is solely for the purpose of gross screening. Accurate tests of central visual acuity, and of peripheral or side vision; tests for determining the muscle coordination of the two eyes; tests for fusion; and a thorough examination of the external and internal parts of the eyes are a part of the eye examination of the ophthalmologist and are not done in the regular course of the nurse's inspection.
6. *The Eye Health of Young Children. No. 176.
7. The Symbol E chart is used by the National Society for the Prevention of Blindness.
8. Suggestions for testing of visual acuity can also be secured from the National Society for the Prevention of Blindness.
9. *Conserving the Sight of School Children. No. 6.
10. Light is measured in foot-candles. A light meter for measuring the intensity of illumination can sometimes be borrowed from a local light and power company. Information concerning the light meter can be secured from the National Society for the Prevention of Blindness or by writing directly to the following companies: Weston Electrical Instrument Corporation, Newark, New Jersey; Westinghouse Electric Company, 30 Rockefeller Plaza, New York, N. Y.; Sight-Light Corporation, 342 Madison Avenue, New York, N. Y.
11. Ferree, C. E., and Rand, G.: The Testing of Visual Acuity, *American Journal of Ophthalmology*, 17:7, July, 1934.
12. Standard test material, standard illumination on the chart, and a consistent method of testing are desirable from the standpoint of the individual's eye record to determine improvement or loss of visual acuity, and also from standpoint of all records

in order to have comparable records for study. A standardized procedure in testing vision is particularly desirable for nurses doing school inspections, so that some basis for comparison may be kept from year to year. Nurses moving from one community to another can carry out their programs with less loss of time if standardized equipment and methods are used by all nurses.

13. The fusion faculty is not present at birth, but develops during the period of growth. Most authorities consider that the fusion faculty is complete by the age of six. Fusion is the ability of the brain to unite the images of each eye so that only one image is perceived. Largely as a result of this process it is possible to observe not only length and breadth but depth of the object viewed.
14. *Ibid.* 3. The Causes of Blindness in Children.
15. *Eyes Saved in Industry. No. 62.
16. *Lighting for the Conservation of Vision. No. 123.
    *Lighting the Home for Health and Happiness. No. 53.
    *The Well-Lighted School House—A Co-operative Effort. No. D54.
    *Standards of School Lighting. Prepared jointly by The Illuminating Engineering Society and the American Institute of Architects. No. D77. (This bulletin is being revised.)
17. *Eye Hazards in Play. No. 146.
18. *National Safety Code for the Protection of the Heads and Eyes of Industrial Workers. No. D81.
19. *Eye Protection in Industry. No. 77.
20. *Sight-Saving Classes in School Systems. No. 4.
21. *Organization of Sight-Saving Classes. No. 88.

A Sight Conservation Program in School*

Edythe P. Hershey, M.D.

AN exposition of the methods used by the Dallas, Texas, Board of Education in carrying out its sight conservation program in the schools

A COMPREHENSIVE sight conservation program in a department of school health work should include: 1. Routine annual examination of children to determine those who have defective vision; 2. A follow-up program for correction of such defects; 3. A study of findings to determine the cause and prevention of impaired vision, as well as the relation of such impairment to the child's progress and adjustment in school; 4. Health education projects dealing with care of the eyes.

Annual routine vision examinations are necessary for all children in order to detect vision defects in the early stages, so that adequate correction may be made and progress of such defects arrested if possible. A program for annual routine examination of vision was started in 1930–31. During this session 75 per cent of the children enrolled were examined and 10.6 per cent were found to have vision defects. However, it was found that only 7.5 per cent of these had corrections and it was evident that an educational program was necessary to inform parents concerning the defects found and the need for adequate correction. For the past two years this program has been emphasized. The known cases were followed from year to year and during the past year practically every child enrolled had a vision examination. Twelve and one-tenth per cent were found defective. Of these, 31 per cent have been corrected. It was possible to increase the number of corrections from 141 during 1930–31 to 1,180 during 1932–33 by a care-

* Abstracted from a report to the Board of Education, Dallas Public Schools, Dallas, Texas.

fully outlined program to follow every case from year to year regardless of the number of transfers the child might make from school to school.*

The nurses were given three lectures of instruction in eye examinations by a member of the Eyesight Conservation Committee of the Academy of Ophthalmology and Otolaryngology. The goal was set to examine every child enrolled. Lists were prepared of defective vision cases reported the two previous years so that these cases could be given immediate attention rather than delay corrective work until the case was discovered by routine examination. The follow-up phase of the work was organized so that the parents were informed of the defect found, advised concerning proper care, and repeated contacts were made to insure correction. Parents were invited to school so that the examination could be demonstrated. If the parent did not respond, home calls were made. If the economic status of the family did not make it possible to provide for the correction, the case was referred to a clinic. Through the interest of the Lions Club a fund was provided for buying glasses at cost for indigent children. One hundred and ninety-four cases were enabled to get the prescriptions for glasses filled through this fund. Twenty-seven per cent of the cases corrected were referred to clinics and sixty per cent of these were referred for help in getting the glasses prescribed.

While the sight conservation program has made it possible to detect the cases of impaired vision and do the follow-up work on these cases, it is advisable to study our findings to determine the cause and prevention of the defects. We should then correlate these findings with the child's progress and adjustment in the school program and finally evolve a health education project regarding vision problems from the broadest viewpoint.

The study of vision defects necessitates refraction of the eyes to determine the condition of the eye as well as to determine the visual error and its correction by properly fitted lens. These examinations are done by ophthalmologists, either in private practice or through clinics. The function of the school health department is to sift out cases with defective vision and advise the

**Author's Note:* Since this report was made, the number of corrections has been increased to 65 per cent of the discovered defects.

parents and teachers concerning the child's condition. The majority of cases can be grouped as nearsighted, farsighted, astigmatic, or strabismus (crossed eyes). However, a number of cases have been found in which the underlying factor was congenital syphilis and these have been put on treatment accordingly, thus preventing progress of a most unfortunate condition. A few tuberculosis cases have been revealed by the interest which began in finding a vision defect. Other cases have abnormal eye conditions which materially affect the child's progress and if these are not under observation and understood by teachers and the school nurse, the child may be further handicapped by driving forces too heavy for him to carry.

A rather superficial study was made to notice the improvement in corrected cases. The results were most gratifying even though the study was not extensive. Case reports revealed not only marked improvement in academic progress, but a complete change in attitude and interest in many instances. Behavior problems and truancy cases showed personality changes and better attendance. Retarded cases have been able to make the grade when the vision defects were corrected but too large a number are repeatedly retarded because of inattention and reading disabilities which could be eliminated if the children had good vision without nervous strain.

The problem of the lighting conditions under which the child works is closely related to the problem of vision defects. While the vision defects will be found in both poorly lighted rooms and well lighted rooms, it has been demonstrated beyond doubt that those with vision defects receive the greatest benefit from good lighting, while those with normal vision become fatigued more quickly working under poor lighting conditions because of the eyestrain and nervous tension resulting from the frequent accommodation changes necessary.

It was, therefore, deemed advisable to study the lighting conditions in the schools as a number of lighting problems had been brought to the attention of the Department of School Health Work. To eliminate the personal factor in judging the lighting, an illuminometer was borrowed so that the intensity of available light could be scientifically determined in every room throughout

the elementary system. In this study an attempt was made to answer the following questions:

1. Are the natural lighting facilities in the room adequate?
2. Does the teacher understand the principles of good lighting and comply with these principles by the proper use of shades and best possible seating arrangement?
3. Is artificial light available and adequate for improperly lighted rooms or for other rooms on dark days?
4. Is the proper use made of artificial light to conserve vision as well as electricity?
5. Is the lighting of the room considered as a health education project and good principles of lighting made possible and adhered to?

The standards adopted were those set forth by the American Standards Association under joint sponsorship of the Illuminating Engineering Society and American Institute of Architects, September, 1932.

It was found that in several instances the natural lighting facilities were inadequate even though the examination was made on a bright day. A larger number showed inadequate facilities for cloudy days. Dallas weather bureau records show that during the school days there may be a rather high percentage of cloudy days. In the 1930–31 school session one hundred clear days were reported, thirty-four partly cloudy and forty-one cloudy or rainy.

In several instances the natural lighting conditions could be improved by treatment of the walls to provide a lighter tint with increased reflection. Trees and shrubbery eliminate light in a number of rooms. The arrangement of the seats could be improved in a number of rooms so that the lighting might come from the left rather than the right, and the seats moved to that part of the room which is most adequately lighted. This is particularly true in some of the primary rooms where the project material is used.

It was found that while the teachers were interested in getting good lighting, they do not always understand the underlying principles, nor distinguish glare from adequate light. A few rooms have a real problem of glare from reflected light and effort

might well be made to correct this. However, there is a tendency for the teachers to keep the rooms too dark. The condition of the shades indicated improper use of them. Many shades could not be adjusted. The cords were often missing or too short to allow for adjustment. Where dark shades are provided for the visual education work it was found that they do not roll in many cases and no provision was made for adjustment, so that these heavy shades cut out available light to a marked degree. Heavy opaque shades should be replaced as soon as finances permit. A teacher frequently judged the lighting of the room from her position rather than from that of the pupils.

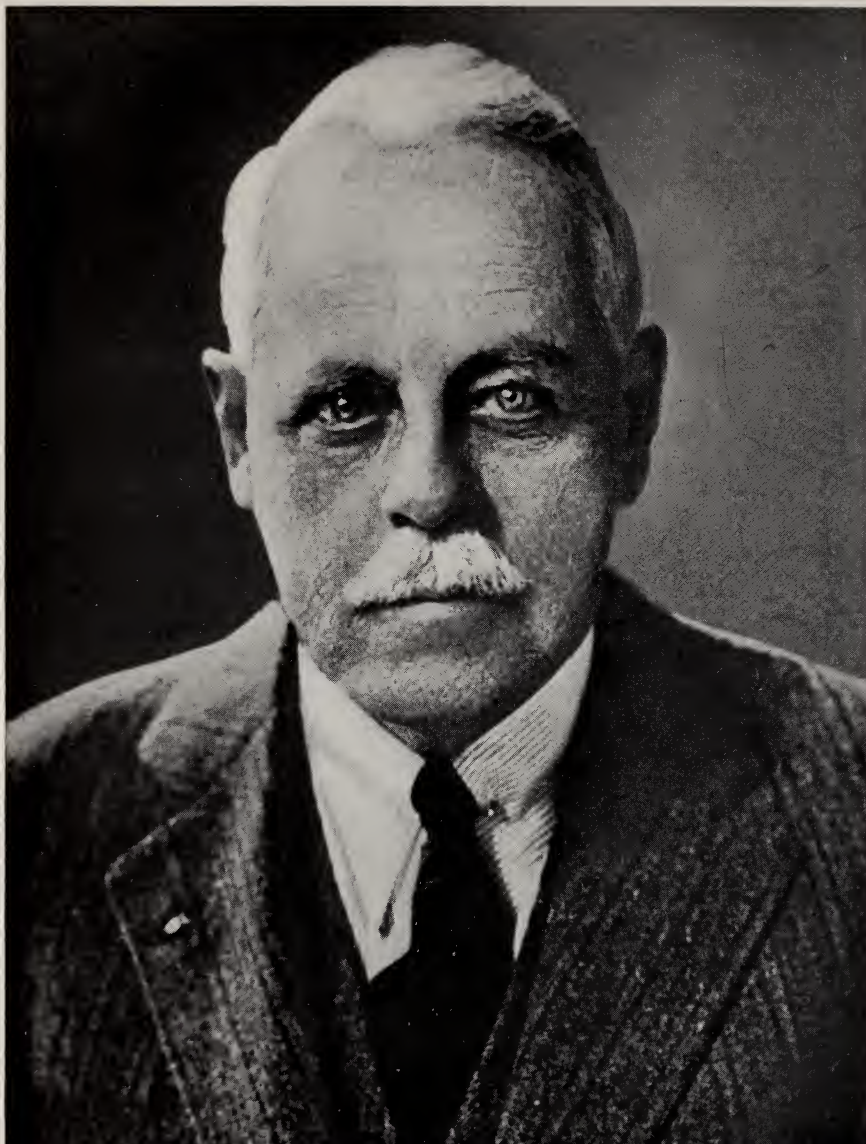
In the great majority of rooms artificial light is not often necessary. A study of artificial light provided revealed that many rooms have no means of artificial light regardless of how dark the day may be, and the majority of these with artificial light, excepting the new buildings, have a type of lighting not only inadequate but frequently of a harmful nature. The type referred to is that from open hanging globes. The majority of globes are clear rather than frosted and result only in a bright glare without diffusion. The globes vary in intensity, thus giving an uneven distribution of light, and are hung low in the rooms. The globe in use, where the illuminaires are used, is not always of sufficient strength for the area to be illuminated.

The distribution of outlets is not always adequate nor properly arranged. There are times and conditions where artificial light is essential, especially in art rooms and writing rooms. In some rooms no attempt is made to carry on a regular teaching program on rainy or dark days because of inadequate light. True economy in the use of light cannot be measured entirely by the electric light bill.

Every teacher should be concerned with the health education aspects of the lighting problem regardless of the subject she teaches. Children with vision defects were not always placed to the best advantage in the room. It was evident that more emphasis must be given to the lighting problem so that teachers and children will become more light-conscious in order that they will utilize the best available light. It is often easier to snap the button to turn on the light than to adjust the shades.

In consideration of these findings, the following recommendations are made with regard to the eyesight conservation program:

1. The annual routine vision examinations be continued and well organized follow-up be carried on in every case;
2. Further study be made to determine the cause and prevention of vision defects with particular study of the problems of retardation in children with serious vision handicaps, as well as their behavior and adjustment problems;
3. Further study of the lighting problem in our schools with a view to correction of those conditions which are particularly in need of correction.
4. The educational program should be sufficiently broad to cover all aspects of eyesight conservation. This will include:
   a. Education of the child concerning care of eyes;
   b. Education of parents concerning care of child's eyes and proper correction of defects;
   c. Informing the general practitioner in medicine as well as the Dallas Academy of Ophthalmology regarding the eyesight conservation program in the schools so that cases will be carefully studied and referred for adequate treatment and correction;
   d. Instruction for teachers concerning proper lighting adjustments for children with vision defects and an understanding of such defects so that children with symptoms of eyestrain may be referred to the nurse;
   e. Study of this program by the administrative officers so that there may be efficient lighting and true economy in the use of lighting; so that available natural light may be utilized to the fullest extent; and so that artificial light be conserved when not needed and provided when needed.



William Holland Wilmer: 1863–1936

Editorial

Dr. William Holland Wilmer

IN the passing of William Holland Wilmer his friends have lost a wise and sympathetic counsellor, his patients an understanding and inspired clinician, ophthalmology a great leader, and the world a great humanitarian.

On Dr. Wilmer's birthday, August 26, 1933, his pupils, associates and friends joined in wishing him health and happiness and many more years of fruitful endeavor and at that time dedicated to him a book, *Studies in Ophthalmic Science.* Those who were closest to him and knew him best hoped that, because of his improved health and mental vigor during the past ten years, the wish of his colleagues would give him at least ten years more of useful work, but he died peacefully at the zenith of his mental and physical vigor as he was preparing to leave his home to go to his office on March 12, 1936. He had performed operations the day prior to his death.

Possibly the greatest tribute to Dr. Wilmer and one of the greatest tributes to a living man was the formation of the William Holland Wilmer Foundation in 1924 by a group of his friends and patients. Mrs. Henry Breckinridge, the outstanding leader in this movement and one of the directors of the National Society for the Prevention of Blindness, was one of those who made an address when the Wilmer Ophthalmological Institute was dedicated at the Johns Hopkins University and the Johns Hopkins Hospital, October 15, 1929. Others who spoke in honor of Dr. Wilmer at that time were Herbert L. Satterlee, president of the William Holland Wilmer Foundation, Dr. George E. Vincent, president of the Rockefeller Foundation, Hofrat Ernst Fuchs of the University of Vienna, Sir John Herbert Parsons of the University of London and Dr. George E. de Schweinitz of the University of Pennsylvania.

For years students of ophthalmology and those suffering with eye diseases had made paths to his door from all parts of the earth. Upon the opening of the Institute their paths were turned from

Washington to Baltimore, where they received the same care and sympathetic attention whether they were poor or wealthy. Here he trained men in his technic and imbued them with his devotion to ophthalmology and it is certain that his influence will live to stimulate others. He was especially interested in the phases of his work concerned with the prevention of blindness and had been a director of the National Society for the Prevention of Blindness since December, 1925. Recently he co-operated actively in the formation of a District of Columbia Society for the Prevention of Blindness. Two days before his death a meeting was held in Dr. Wilmer's home at which this Society was formally organized, with Dr. Wilmer himself as president.

He was always interested in aviation, and during the World War was in charge of the medical research work in aviation first at Mineola and later in the American Expeditionary Forces at Issoudin, France. He was awarded the Distinguished Service Medal by the United States for his services during the World War and rose from the rank of Lieutenant to that of Brigadier General in the Medical Reserve Corps. He was also honored by France and decorated with the Legion of Honor.

Among the many prominent positions which he held in numerous organizations he was possibly proudest of the presidency of the American Ophthalmological Society. He wrote many monographs on subjects dealing with ophthalmology, and was the editor of the *History of Aviation Medicine* in the A. E. F. In 1934, he completed the *Atlas of the Fundus Oculi*, which contains personally supervised colored drawings of the appearance of the interior of the eyeball in various diseases.

It would be impossible for any one to give an accurate picture of the esteem in which he was held by his many devoted admirers, but the feeling of his friends has been beautifully expressed by one of his patients—"The light of many eyes and the comfort of many hearts has gone."

CONRAD BERENS, M.D.

The Forum

THIS section is reserved for brief or informal papers, discussions, questions and answers, and occasional pertinent quotations from other publications. We offer to publish letters or excerpts of general interest, assuming no responsibility for the opinions expressed therein. Individual questions are turned over to consultants in the particular field. Every communication must contain the writer's name and address, but these are omitted on request

Eyes Right*

The eyes a baby starts with must last all his life!

Immediately following birth, the physician or some one professionally trained removes any mucus from the baby's eyes and inserts two drops of a one per cent solution of silver nitrate into the sac which surrounds each eye—not directly over the lens. This procedure has been generally adopted as a world-wide precaution, especially against gonorrheal infection. All mothers, regardless of how free they themselves may be from any disease, should demand this protection for their babies. Syphilis may be transmitted from a mother who has the disease to her unborn child. One of the manifestations of congenital syphilis is a serious eye condition. Careful physical examinations with blood tests will detect this disease in the pregnant mother; and treatment of her will pass through her body to the child.

We all constantly produce a fluid for the health of our eyes. Tear glands, under the outer border of the eyebrow, produce a secretion which continually bathes the eye; winking distributes this and mixes with it the material from the glands at the hairline of the eyelids. This fluid, with any dust particles present, is carried to the inner corners of the eyes, where it passes through fine ducts into the nostrils. Occasionally the connecting ducts between the eyes and nose are not open at birth, and secretion collects at the inner corners of the eyes or trickles down the cheek. Your doctor will tell you what to do for this—perhaps how to massage, gently, the upper part of the nose. If this canal does not open by the sixth to eighth month, some other procedure may be needed to pre-

* Reprinted, with permission, from *Good Housekeeping*, February, 1936.

vent the constant watering of the eye.

The overhanging bony ridge above the eye is a protection against falls or accidental blows. The lashes help keep out foreign bodies. Instinctive winking when objects come close to the eye prevents some dangers.

All parents know how wobbly are the eyes of a tiny baby. They may "float about," and only as the muscles grow stronger do the eyes work in unison. Some authorities state that three months is the time when you can expect a baby to focus his eyes. If there is a true cross-eye or squint, one eye or both eyes will be strongly pulled inward or outward. When you notice this, place your child at once under the care of an eye specialist. The danger ahead lies not only in the emotional reaction the child feels because he is ashamed of not looking like other children, not only in this handicap to good looks, but also the fact that the stronger eye will be used to the detriment of the other and that vision will gradually fail in the one which is less used.

There are eye exercises and other ways of strengthening the weaker eye. Mothers will do well to follow such directions implicitly, even though these duties must be added to an already well-filled day. Glasses may be suggested for this or other conditions. They can be fitted to children of one year or younger and can be made of non-shatterable glass if your oculist advises it. For certain conditions they need be worn only for a short period or through childhood.

The vision of a baby may be harmed through the mother's incorrect handling of his eyes. We do not wash babies' eyes routinely now, because we believe that Nature does a better job unaided. If you must remove particles of dust, you may use saline solution (½ teaspoonful of ordinary table salt to one glass of previously boiled warm water) or boric acid (1 teaspoonful of boric-acid powder to 1 glass of hot water, also previously boiled). Wipe off any surplus moisture at the *outer* corners of the eyes, and do not allow fluid or secretion to flow from one eye into the other. In case of an eye accident, close the eye and keep a clean soft cloth moistened with either saline or boric-acid solution over it until the doctor comes. In case of inflammation do not use medication until your doctor has had a chance to examine the eye and its secretion and can prescribe for it.

No baby should stare at the sun or at an electric light. Glare from white walls, water, snow, or even skyshine on a fairly dull day may be harmful. Face the baby away from the sun during the sun bath.

The eye has a natural mechanism which protects it against glaring light—the contraction of the pupil, winking, and the closing of the eyelids. Therefore we believe that no

child with normal eyes need be kept indoors on a bright day. Certain other precautions can be taken: the hood of the baby carriage may be lined with dark cloth; nursery walls should be painted a soft, dull tint, and ceilings also should be off-white, as a baby looks upward much of the time; objects should be kept at a distance from the child's face, and toys should not be hung in front of him.

All this detail may seem confusing, but constant vigilance is the price you pay for your baby's eyesight.

JOSEPHINE H. KENYON, M.D.
New York

Note and Comment

English Health Organization Teaches Eye Health.—"Many children are accused unjustly of being dull at school when, in fact, they are handicapped by the inability to see properly and by the consequent nervous strain which is thrown upon them in straining to overcome the defect," warns a press release of the People's League of Health (England). The League urges parents to watch for signs of eye trouble in their children, and urges medical consultation at the first suggestion of visual difficulty; for those of limited means, the National Eye Service is prepared to give expert medical eye examinations and needed spectacles.

Lighting for the Printshop.—Light is shed over every operation in a printing plant, in a recently released report of the Committee on Industrial and School Lighting of the Illuminating Engineering Society, on "Lighting in the Printing Industry." The Committee had found, in previous studies, that one reason for the lack of good lighting in industrial plants throughout the country was the lack of knowledge of specific requirements. This report aims to offer practical information on lighting in relation to operation techniques for printshops.

Fusion Training with Moving Pictures.—Sustained interest and enthusiasm are important tools in the training of fusion in young children. A double motion picture projector, to be used for fusion training, was demonstrated at a meeting of the section on ophthalmology of the Baltimore City Medical Society, according to a note in the *American Journal of Ophthalmology* for December. The twin projectors are as flexible in use as the slide projectors, and it is considered that the moving pictures hold the attention of the children very much better than still slides.

Follow-up of Eye Cases Shows Results.—A marked reduction in the number of cases of high myopia and in the number of partially blind children has been noted in the past year at the Middleton (England) Eye Clinic. Dr. S. T. Beggs, medical officer of health,

attributes the reduction to the frequent re-examinations and careful correction of defects, as well as to the advice given the parents about the care of the eyes at home.

Vitamin A—Eye Vitamin.—For nearly 4,000 years people have recognized the connection between food and the disease known as "night blindness." The Egyptians recommended the eating of liver to cure the disease as long ago as 1500 B.C. In lands where food shortages occur periodically, as in Labrador, night blindness, or xerophthalmia, has been noted during the long winter, and seen to disappear when the first supply boats bring more rounded diets in the summer. Countries having a low standard of living—Japan, China, and India—have many cases of night blindness, because the ordinary dietary is lacking in vitamin A, which is found liberally in milk, butter, eggs, fish, and green vegetables. Cases of xerophthalmia are sometimes noted in persons eating a liberally varied diet, whose systems are unable to assimilate the vitamin content of their food. An eyewash containing vitamin A may offer help to such people, according to an article on "When Starvation Brings Blindness," by F. Le Gros Clark, in the December *New Beacon*.

Aid to Miners.—Improvement of working conditions in mines has been a subject of investigation for many years, and advances have been made which have prevented many of the industrial hazards that mine workers formerly had to face. There has been a general brightening-up underground, which has had a good effect, both physically and psychologically. The more extensive whitening of the roadways, the increased use of steel arches and girders, and the high candle-power illumination at the coal face have made conditions of work more favorable. Miners' nystagmus, an occupational eye disease, has been found to be caused in part by inadequate illumination. The old type of miners' lamp gave off one foot-candle of light, and by the end of the day was so smoky that miners were working in darkness; it has recently been replaced by an electric lamp that gives a 6 foot-candle illumination. In a recent disability-compensation hearing in England, a physician found the claimant's vision normal, and suggested that the man might return to work if he were provided with the new type of lamp.

International Red Cross Seeks End of Syphilis.—"If every syphilitic woman were to undergo the treatment which the specialist can today give her, congenital syphilis would soon be stamped out," says a recent communication from the Secretariat of the League of Red Cross Societies. Describing the effects of congenital syphilis, which may appear before or at birth, shortly after birth, or not for anywhere from five to twenty years, and may attack mind and senses, the communication warns: "Comparatively late in life the eyes may be involved, the cornea losing its normal lustre and looking like glazed glass. This condition may end in almost complete blindness. Indeed, syphilis is the most important of all causes of blindness."

Nurse-of-the-Month Trachoma Worker.—One need not be a specialist in eye diseases to find trachoma one's special nursing and public health problem. *Public Health Nursing's* Nurse-of-the-Month, Maude King of Missouri, tells of the preponderance of work in trachoma in general rural nursing in Missouri. Her story tells of the seriousness of the trachoma problem and the difficulties of finding and treating cases. She says: "One of our first undertakings was a trachoma survey in Miller and Camden Counties, begun in mid-winter. The traveling was so difficult that I soon discarded my own car and set out with a lad in an open model T Ford. My companion never tired in his efforts to make the hills, but often we were compelled to go on horseback to the more inaccessible schools and to the little cabins which could be reached only by trail. Some of the schools were fitly named 'hard scrabble' and 'skin knee.'

"Following our round-up, clinics were held under the auspices of the United States Public Health Service in co-operation with the State Board of Health, which provided equipment for a temporary hospital. The patients were brought in by truck. In the beginning we found schools in the trachoma district with as many as 70 pupils, 50 per cent of whom were victims of trachoma. In making follow-up visits to the homes, we found many infant and preschool children in the primary stages of the disease, and parents and grandparents who were totally blind.

"As a result of this effort and that made by other counties faced

with similar problems, a United States Trachoma Hospital was established in the southern part of the state, convenient to the trachoma settlements. We now keep a close check on new cases which are immediately put under hospital care. Thus, we have been able to eliminate all active cases from schools and homes and through the Missouri Commission for the Blind have been able to give occupational training to a number of the partially blind."

Eye Symposium at Biennial Nursing Convention.—Included in the program of discussion meetings of the National Organization for Public Health Nursing at the Biennial Nursing Convention, to be held in Los Angeles June 15 to 19, is a symposium on eye health. The meeting will be under the auspices of the National Society for the Prevention of Blindness, whose representative, Mrs. Francia Baird Crocker, R.N., will be available for consultation throughout the Convention. The Society will participate in the exhibit, and welcomes all friends and nurses to its booth.

"Perfect Driver" Has "Normal Vision."—With the country becoming seriously concerned over the number of automobile accidents and fatalities has come an increasing demand for more stringent requirements for drivers. Just what rôle vision plays is a question that has been answered variously in state requirements for motorists. In New York State, the Snellen test is given by an inspector to all applicants for drivers' licenses. "The Portrait of a Perfect Driver" by Farnsworth Crowder, appearing in *Westways*, describes the visual requirements: "He (the perfect driver) has normal visual powers. This means normal acuity, or faculty to see, near and far, without fuzziness; normal depth perception, or ability to see into the third dimension and estimate distances; a normal field of vision, a field, that is, of 180 degrees or better, within which movements can be detected; normal color vision; normal resistance to glare, whether of sun or headlights; absence of ocular dominance that is so pronounced as to produce the condition of being one-eyed; absence of the phorias, which produce malfocus or even double vision; absence of an abnormally large scotoma or blind spot; absence of the tendency of the eyes to malinger, or to take vacations at inopportune times."

Insurance companies have a special interest in promoting driving safety, and the Aetna Casualty and Surety Company has recently demonstrated a device which tests many of the important factors in safe driving: a Reactometer measures speed of reaction; devices for testing color vision, effect of headlight glare, speed operation and steering ability are especially valuable. This demonstration unit is available for loan in local safety drives, and its use has not only emphasized the need for more selective licensing, but has given individual drivers an estimate of their powers and limitations.

Another addition to safe driving comes with the perfection of a polaroid glass; clear and colorless, it appears to be an ordinary glass, through which oncoming objects may be seen in the usual way. Glare, however, is deflected, because of the polarization of the light, which causes all the light rays to enter through the glass in straight, parallel planes. When blinding headlights, equipped with a sheet of Polaroid placed behind each headlight lens, are viewed through a Polaroid windshield, these brilliant lights appear to be almost out, although objects between the two sets of lights are brilliantly illuminated. Road tests have demonstrated that the whole of an approaching car can be seen, even to the exhaust fumes in the rear; pedestrians are seen as clearly as if no car were approaching. Through the use of Polaroid headlights and windshields the glaring headlight hazard, which has been an important factor in the increase of motor accidents after dark, can be eliminated at last.

The Ascertainment of Blind Children.—To meet the evident need of reaching blind children during the formative preschool years, the Child Welfare Committee of the League of Nations has undertaken a study of methods of discovering blind infants and young children. The formal census is not a reliable method of finding these children because the definition of blindness—too blind to be able to read ordinary school books—cannot be applied to young children. Then, too, parents, fearing that they might be separated from their child, are reluctant to volunteer such information. Although compulsory notification, either on the part of parents, physicians, parish priest, or health visitor might be brought about, it would be useless, according to the Committee's

report, unless it were supplemented by provisions which would aim at assisting the parents in the education of the blind child. Unfortunately, the prevention of blindness and its medical treatment are outside the scope of the Child Welfare Committee's inquiry; it is to be hoped, however, that the information might not only ameliorate the condition of the young blind child, but contribute to knowledge concerning causes of blindness and suggest practical steps to those organizations having special interest in the prevention of blindness in saving the sight of children yet to be born. The report is supplemented by reports from 22 countries on what is now being done to enumerate blind children.

Social Hygiene Association Offers Co-operative Membership.—In strengthening the relationship between the agencies working for eradication of venereal diseases and those striving for prevention of blindness, the American Social Hygiene Association is inviting "society memberships" in its organization to the National Society for the Prevention of Blindness and to all other groups having the prevention of blindness as a primary aim. A feature of the society membership provides that state and local society members may propose their individual members for joint membership in the Association, with full privileges of the *Journal of Social Hygiene*, the Social Hygiene News, pamphlets, etc., for $1.00 yearly dues.

Eye Safety a Vital Lesson in T.E.R.A. Projects.—"Eye injuries are one of our big problems," says director of safety R. I. Morrow, of the State of New York's Temporary Emergency Relief Administration, in a letter to the National Society. "We have distributed many thousands of goggles which are used on T.E.R.A. projects where they are breaking or chipping stone, or doing other work involving eye hazards. We have sent out posters and bulletins, we have had many safety meetings, discussing all types of eye injuries, and in extreme cases we have even laid off foremen and men who would not carry out the safety regulations. I think that we now have the situation pretty well in hand, and that the men are educated and realize the necessity of wearing goggles. It is indeed a pleasing sight to visit some projects in a remote part of the State

and find all the men who are breaking stone, wearing goggles over their eyes and not as necklaces. Of all the injuries occurring on T.E.R.A. projects, 2.3 per cent are eye injuries. One lost time eye injury occurs for each 3,333,000 man-hours worked." An analysis of the frequency of causes of eye accidents on the projects shows that breaking stone or concrete, or working nearby, accounts for 35 per cent of the accidents and walking or running into tree twigs or handling them accounts for 13.5 per cent. Another frequent cause of eye accidents is flying sand, occurring in 11 per cent of the accidents.

Michigan Rehabilitates Partially Blind.—Six hundred and sixty-eight partially blind persons have found employment in Michigan between the years 1921 and 1935, according to a report from the Division of Rehabilitation of the State Department of Public Instruction. Salaries ranged from between $10 to over $50 a week; selling, stock chasing and handling, machine operating, inspecting, assembling, and unskilled labor were job classifications in which most placements were made. The median salary fell between $21 and $30 a week. The normal range of salaries is encouraging to the promotion of adequate vocational rehabilitation.

Taking Chances with Blindness in Illinois.—Concern is shown by the Illinois Department of Public Health over reported figures of births as against the number of ampules of silver nitrate supplied free by the Department. In the 16 counties reporting, 8,614 babies were born, and only 3,221 ampules of silver nitrate were distributed to those counties. Says the *Illinois Health Messenger:* "While it is possible that silver nitrate was purchased in some instances, the probability of purchases enough to make up the discrepancy is remote. Silver nitrate solution has been distributed free by the State Department of Public Health for many years, so that practically all concerned with its use are aware of this fact. The weight of the evidence, therefore, favors the conclusion that no prophylaxis was used in the eyes of a considerable proportion of the babies born." Will figures four and five years from now show an increase in the number of children entering schools for the blind, afflicted since birth with a preventable blindness? asks the *Messenger.*

Causes of Blindness in Glasgow.—Analyzing the causes of 1,460 cases of blindness, it was found that congenital and undetermined causes—including myopia, the largest single cause of blindness—were the most frequent factors in blindness. The second largest group, blindness caused by infectious diseases, included blindness due to venereal diseases and chronic sepsis and accounted for 11 per cent of the whole. When separated into age groups, it was found that ophthalmia neonatorum and congenital syphilis are the greatest causes of blindness up through the age of four; myopia, the most common individual cause of blindness, occurring in 17 per cent of the cases, develops chiefly between the ages of five and fifty. Of interest is the knowledge that "total blindness due to gonorrheal ophthalmia is now of rare occurrence. This notable advance has been made possible by the inclusion since 1912 of ophthalmia neonatorum among the notifiable diseases, and the subsequent arrangements made for prompt notification and hospital treatment, and for the supervision of midwives under the Midwives' Act. Between 1912 and 1932 only six children have become blind in both eyes (none since 1924); loss of sight in one eye has occurred in 42 cases (six since 1921 and none since 1930); recovery with some degree of impaired vision was noted in 50 children (ten since 1921, and one since 1929). There is evidence that syphilis, both congenital and acquired, is tending to decline. Antenatal treatment of syphilitic infection is an important factor in prevention of the congenital form of this disease."

Protect Eyes Against Infection.—Not all serious eye accidents occur among careless children or thoughtless workmen; recently a technician at the National Institute of Health, Miss A. M. Pabst, while injecting meningitis culture into an experimental animal, accidentally squirted some of the culture into her own eye. The danger was immediately realized, and every effort exerted to cleanse the eye before the infection spread further, but without avail. This gifted bacteriologist died of meningitis ten days later. From a hospital comes the story of a surgeon who was operating on a patient with a lung abscess. A droplet of the infected matter hit his eye, and because he could not stop the operation to have medication applied, the eye became seriously affected, and only nar-

rowly escaped destruction. The surgeon states: "I was not wearing glasses or protective goggles at the time and did not stop the operation immediately to allow any medication to be put in my eye. The lesson to be learned here is identical with industrial hazards: if glasses or goggles are worn and immediate medication dropped into the eye, practically all eye infections could be eliminated." The editorial of the January *Safety Engineering* comments: "Medical, surgical, and bacteriological associations can perform a valuable service to their members by furthering the cause of infection prevention through pointing out the need for eye protection when the eyes are exposed to dangers."

Cod-Liver Oil Cures as Well as Prevents.—Cod-liver oil, which is a rich source of vitamin A, the eye vitamin, has proven to be an effective treatment for certain eye diseases, according to a communication in the *Lancet* for December 14 from Dr. Edgar Stevenson of Liverpool. Local applications of cod-liver oil were effective in treating a burn of the eyeball, and encouraged by the success in cases of burns, Dr. Stevenson used frequent applications of cod-liver oil on the eyes of a child having a stubborn case of chronic ulceration of the cornea. The case, which had persisted for 12 months, cleared up in four days with the cod-liver oil treatment. Other eye disorders on which the treatment was effective were chronic keratitis, ulcers caused by foreign bodies, phlyctenular conditions, and corneal roughness and superficial ulceration of trachoma.

Syphilis Clinic Opened at Perkins.—A clinic for the treatment of children with congenital syphilis has been opened in the past year at Perkins Institution and Massachusetts School for the Blind. In the past, fear had been felt that children with congenital lues could not be admitted to the school for fear that their condition was infectious; it has been discovered that when such children are under treatment, their condition ceases to be contagious. By providing treatment at the School, further progress of the disease is checked, and the children are permitted to gain the advantages of education suited to their handicap far earlier than might otherwise be the case.

National Society Notes.—Mr. Lewis H. Carris, managing director, has returned from an extensive field trip through Texas, New Mexico, Arizona, California, Colorado and Louisiana. Intensive work in California—in Los Angeles, San Francisco, Fresno and Sacramento—has stimulated prevention of blindness programs and awareness among physicians, ophthalmologists, business men, and educators in that state.

Mrs. Winifred Hathaway, associate director, attended the Farm and Home Week in Ithaca, under the auspices of the New York State College of Home Economics, where she lectured to lay groups on the prevention of eyestrain in the home and school and on lighting for health. An exhibit of the Society's posters and publications was a feature of the Week. Mrs. Hathaway and Dr. Anette M. Phelan, staff associate in education, represented the Society at the annual meeting of the National Education Association in St. Louis. At the same time, Mrs. Hathaway visited Joplin and Springfield, Missouri, under the auspices of the Missouri Commission for the Blind, addressing teachers on school problems and the conservation of sight.

Mrs. Eleanor Brown Merrill, associate director, and Miss C. Edith Kerby, statistician, attended a meeting in Washington of the Social Security Board, to discuss the measures to be incorporated in providing funds for the medical care of the blind.

The Society co-operated in the seventh annual Greater New York Safety Conference, where an exhibit of posters and continuous showing of the film, "Preventing Blindness and Saving Sight," attracted attention. The Society is happy to announce that Mr. G. E. Sanford, safety director of the General Electric Company has accepted an invitation to serve on the Society's Advisory Committee on Industrial Eye Hazards.

Current Articles of Interest

The Relation of Vitamin A to Anophthalmos in Pigs, Fred Hale, *American Journal of Ophthalmology,* December, 1935, published monthly by the Ophthalmic Publishing Company, St. Louis, Mo. Four litters of pigs, whose mothers had been deprived of vitamin A before and during gestation, were born blind. While it is not possible for a human mother to be so completely deprived of the vitamin A factor, even in a restricted diet, the author offers the suggestion that many of the eye weaknesses that we suffer may be due to maternal deficiency of vitamin A; in any case, concludes the author, it is obvious that until we have evidence to the contrary, we should insist on an abundance of vitamin A in the diet of the expectant mother in the early stages of pregnancy when so many of the vital organs are being formed.

If Your Child Has Headaches, Edwin F. Patton, M.D., *Parents' Magazine,* December, 1935, published monthly by the Parents' Publishing Association, Inc., New York, N. Y. "Don't accept a headache lightly as something to be endured, but make every effort to discover its cause—and then eliminate it," the author advises. He suggests a near as well as distance reading test to eliminate the possibility of farsightedness or astigmatism being the cause of chronic headache. "Every child with headache should be given the benefit of a thorough test of vision, under drops, by a competent specialist," says this physician. Other common causes of headaches lie in poor hygienic living; remoter causes of headache are also discussed.

The Lysozyme Content of Tears, William M. James, M.D., *American Journal of Ophthalmology,* December, 1935, published monthly by the Ophthalmic Publishing Company, St. Louis, Mo. Analysis of the tears collected from a hundred normal eyes shows that tears contain a powerful bacteriolytic and bacteriostatic action against the invasion of the tissues by bacteria. The majority of air-borne organisms are completely lysed by tears; . . . the

profuse lacrimation which follows the instillation of two per cent silver nitrate in the eyes of the newborn probably contributes to the effectiveness of the Credé technique. . . . The fall in the lysozyme content of tears with continued epiphora, with vitamin deficiency, and with corneal lesions, indicates that if the eye is to be protected, the cause of the epiphora should be removed, a diet adequate in vitamins maintained, and the normal flow of tears and the mechanical action of the lids not inhibited.

Glaucoma, with Special Reference to Medical Aspects and Early Diagnosis, H. M. Traquair, M.D., *British Medical Journal,* November 16, 1935, published weekly by the British Medical Association, London, England. Primary glaucoma is a disease of unknown origin mostly affecting elderly people of nervous temperament. It is essentially a disease of the patient rather than of the eye. The author concludes that glaucoma is to be diagnosed by the clinical picture as a whole, not by any one sign. The only pathognomonic sign is increased tension, and this is not always elicited.

Trend in Number and Severity of Eye Injuries, Division of Statistics and Information, *Industrial Bulletin,* November, 1935, published monthly by the State of New York, Department of Labor, Albany, N. Y. Eye injuries have been chosen as the first of a series of studies in frequency and severity of different kinds of industrial injuries because they have always been among the most serious, both in cost to the employer and in handicapping the workman in his future work. Because of their seriousness, eye accidents have received considerable attention, with the result that this group of industrial injuries has shown a greater reduction in number than any other. As far as it is possible to judge from the figures that are available, the percentage reduction in number of eye injuries is also greater than the decrease in employment. It is interesting to note, in practical terms, the decrease in the cost of a closed, eye accident compensation case from $593, in the interval 1925–1930, to $580 in the 1931–1935 interval; cost of compensation in other cases, in the same period, rose from $304 to $316. The total cost of closed eye accident compensation cases has fallen

nearly a million dollars since 1930: in that year, $1,933,134 was paid in eye compensation cases, while in 1934, only $954,239 was paid for the same cause. The Department of Statistics and Information, in retailing this information, adds that the use of goggles, when operating such machines as abrasive wheels, better safety measures, and education in accident prevention have been successful in reducing costly injuries in factories.

The Diagnosis and Treatment of Trachoma, Everett L. Goar, M.D., *Texas State Journal of Medicine*, December, 1935, published monthly by the State Medical Association of Texas, Fort Worth, Texas. The author calls attention to the differentiation between folliculosis and trachoma in protest against excluding children with folliculosis from school over indeterminate periods. During fifteen years of careful observation, the author has come to the conclusion that there is practically no trachoma among the school children of his city (Houston), and only five cases of trachoma in children were seen in that time, three of whom were from out of the city.

Phlyctenular Disease and Vitamin Deficiency, Leonard G. Redding, M.D., *Pennsylvania Medical Journal*, December, 1935, published monthly by the Medical Society of the State of Pennsylvania, Harrisburg, Pa. The author states that phlyctenular disease is not an entity, but a local manifestation of a general condition. The great fall in the incidence of phlyctenular disease is attributed to the increased emphasis placed upon vitamins in the diet of American children. It is of interest to note that not until the early years of the past decade were fresh green leafy vegetables available the year round for the average consumer, and coincident with the rise in consumption of green vegetables there has been a sharp decline in the incidence of phlyctenular disease. The author believes that vitamin A deficiency is the cause of the disease, and that increase in the amount of cod-liver oil given serves to effect a rapid cure.

The Use of an Extract of Adrenal Cortex in Glaucoma, Alan C. Woods, M.D., *Archives of Ophthalmology*, December, 1935, published monthly by the American Medical Association, Chicago, Ill.

Widespread publicity given the claims for adrenal cortex extract as a cure for glaucoma led the author and his associates on the staff of the Wilmer Ophthalmological Institute to investigate and evaluate the theory. Twelve glaucomatous patients were given experimentally the adrenal cortex extract treatment, and the author concludes: "A study of the effect of the administration of adrenal cortex extract on the intra-ocular tension of patients with glaucoma and chemical analyses of the blood of such patients before and after the administration of adrenal cortex extract, together with what is known of the physiologic action of this substance, lend no support either in fact or fancy to the theory of the pathogenesis of glaucoma advanced or for the therapeutic use of this extract in glaucoma."

Technic of Orthoptic Training in Squint, Luther C. Peter, M.D., *Archives of Ophthalmology*, December, 1935, published monthly by the American Medical Association, Chicago, Ill. The essential phases of successful training are: correction of amblyopia at an early age; concentration with the synoptophore, which is an amplified amblyoscope; judicious use of surgical intervention when this step becomes necessary; enthusiasm in all details of the work and open and unbiased mental attitude as to the results. The author concludes optimistically that "What has been accomplished by some ophthalmologists who have worked long in this field is within the reach of all."

Book Reviews

GENERAL OPHTHALMOLOGY. S. A. Agatston, M.D. Privately printed by S. A. Agatston, 1934. 170 p.

The difficult task of condensing the essentials of ophthalmology into a book of one hundred and seventy small pages has been accomplished by Sigmund A. Agatston. The book is intended as a short treatise for students and practitioners.

The author's first chapter is concerned with the important problem of testing visual acuity and the causes of poor vision. He then considers diseases of the eyelids, prefacing the subject by a brief review of the anatomy of this part. These chapters are followed by those describing diseases of other parts of the eye, for example, the retina and optic nerve, and include the consideration of glaucoma, cataract, and detachment of the retina. The chapters devoted to the study of errors of refraction, the use of the ophthalmoscope and arteriosclerosis are particularly valuable.

Because the book is filled with statements founded on Dr. Agatston's own broad clinical experience and because he makes many valuable practical suggestions for treatment, it is especially useful for the student of ophthalmology who is unable to evaluate the numerous suggestions for treatment made in the more comprehensive books on ophthalmology.

The last chapter is devoted to the study of the retinal vessels in the evaluation of ophthalmoscopic findings and their relation to general as well as local disease. This chapter as well as many of the other parts of the book will be of interest to any ophthalmologist.

An excellent index and table of contents add to the value of the work.

CONRAD BERENS, M.D.

Briefer Comment

CONCOMITANT STRABISMUS. T. B. Travers. London: George Pulman and Sons, Ltd., 1936. 127 p. ill.

This study of the treatment of squint by various methods was an essay presented for the Gifford Edmonds Prize in Ophthal-

mology. The author compares the visual results obtained by various methods employed for the treatment of concomitant strabismus, and concludes that within certain limits, the orthoptic treatment may bring about successful results. Faced with a wide angle of squint, however, he would operate, without hope of training fusion. He suggests that the case records presented be accepted as a provisional guide until more figures are compared over a period of years.

Clear-Type Readers. Nos. 1 and 2. London: National Institute for the Blind, 1935. 30 and 32 p.

The first two books in large type to be published in England were printed expressly for the use of local education authorities, in accordance with the recommendations of the Board of Education Committee of Inquiry into Problems Relating to Partially Sighted Children. The first book, printed in 24 point type, is a passage from Richard Jeffries' *Wood Magic:* the second, containing excerpts from Stevenson's *Night Among the Pines;* Brontë's *School at Lowood;* and Jerome's *Packing*, is printed in 18 point type. The material is carefully edited, and comment and exercises add to its usefulness in classroom work.

All the Children. Thirty-seventh Annual Report of the Superintendent of Schools, City of New York, School Year 1934–1935. New York: Board of Education, 1935. 133 p.

Departing sharply from the stylized conventional school board report, the Superintendent of Schools has presented a stirring and comprehensive picture of the high spots of New York's 1,121,000 school population and its problems. The book with a large attractive format, fully illustrated by many photographs of the schools in action, covers such topics as special classes for the handicapped; individualization of education; extra-curricular activities and vocational counseling. Adopting a tabloid technique, the report's headlines and pictures bring alive the activities of the school in terms of individual children.

Current Publications on Sight Conservation

Note.—The National Society for the Prevention of Blindness presents the most recent additions to its stock of publications. Except for the more expensive ones, single copies are sent free upon request. Unless otherwise specified, they are reprinted from THE SIGHT-SAVING REVIEW. New publications will be announced quarterly.

190. Eye Openers, Emanuel Krimsky, M.D. 12 p. 10 cts.
Every doctor will recognize in this article questions which have been presented to him by patients in the course of his medical experience, and patients will find the answer to many of the questions that they have not had time to ask.

191. Illumination Intensities for Reading, Miles A. Tinker, Ph.D. 8 p. 10 cts.
This is the second of a series of articles on illumination designed to meet the inquiries of ophthalmologists, school officials, business and factory directors, and parents.

192. Heredity in Relation to the Eye, Prof. H. Lauber. 4 p. 5 cts.
The eye may be considered one of the best sites in which to study transmission of anatomical structure, physiology, and pathology from generation to generation.

193. Squints and Squint Training, James H. Allen, M.D. 12 p. 10 cts.
To correct cross-eyes, treatment must be begun early and followed consistently.

194. Eye Health Primer for Nurses, Francia Baird Crocker, R.N. 16 p. 15 cts.
An outline on eye health for the guidance of nurses—whether school, public health, private duty or hospital nurses.

195. A Sight Conservation Program in School, Edythe P. Hershey, M.D. 8 p. 10 cts.
An exposition of the methods used by the Dallas, Texas, Board of Education in carrying out its sight conservation program in the schools.

196. Eyes Right, Josephine H. Kenyon, M.D. 8 p. 5 cts.
Advice to mothers and nurses on care of the eyes of the young infant and the small child.

D86. **Room Design and Equipment Requirements for Sight-Saving Classes,** Winifred Hathaway. Reprinted from the *American School and University*, 1936 edition. 8 p. ill. 10 cts.

Size, illumination, and equipment specifications are outlined for a sight-saving class.

D87. **Syphilis in Pregnancy,** Max J. Exner, M.D. Reprinted from the *Journal of the American Medical Association*, February 8, 1936. 12 p. 10 cts.

Answers to the questionnaire on examination of the blood of the expectant mother show that the need for the tests, while less emphatic among private patients, is none the less real.

Contributors to This Issue

Dr. Emanuel Krimsky specializes in practice of eye, ears, nose, and throat in Brooklyn.

Dr. Miles A. Tinker, assistant professor of psychology at the University of Minnesota, has taken a special interest in the problem of lighting in relation to reading.

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Dr. James H. Allen is a member of the department of ophthalmology, College of Medicine, State University of Iowa.

Mrs. Francia Baird Crocker, R.N., is associate for nursing activities of the National Society for the Prevention of Blindness.

Dr. Edythe P. Hershey is director of school health work of the Dallas public schools.

Dr. Conrad Berens, who has played the rôle of mentor and guide in many prevention of blindness projects, is well known to readers of the Review.

The Sight-Saving Review

Volume VI Number 2

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Glaucoma

Philip A. Halper, M.D., F.A.C.S.

THE glaucoma patient who seeks the aid of an ophthalmologist early, carries out the doctor's advice faithfully, and remains under medical supervision permanently has a good chance of preserving his sight

THOSE who know the rôle which sight plays in the satisfaction derived from daily activity in social and creative life must look with fear upon any condition which can disastrously affect the vision.

Incidence

Glaucoma, that malignant disease so irreparably destructive to sight, especially when unrecognized, comes on either insidiously without warning or with symptoms so violent as sometimes to hide from consciousness its identity as a disease of the eye. In the United States there are over 100,000 blind persons and a far greater number who are partially sighted. Among the causes of blindness glaucoma takes a large toll, about ten per cent of all blindness being caused by this disease. It occurs at any age from infancy to senescence but is most frequent among adults.

Definition

Glaucoma is characterized by an increase in the intraocular pressure and results in the destruction of the retina by depriving it of its nutrition. It can be compared to destructive changes in the brain by persistent, increased intracranial pressure, or to violent symptoms and death in impaired kidney function. The disease results from an abnormal increase in the secretion of aqueous humor or, as is more commonly found, from an inadequate drainage of this fluid through the usual channels of exit.

Types

Glaucoma occurs in various forms. It may be either congenital or acquired. There are primary and secondary types; the former is found in a previously healthy eye, while the latter results from accompanying intraocular disease. In all its variations the end results when uncorrected are the same, namely, total blindness. The congenital type is present at birth and is due to an absence of the drainage structures. This leads directly to an abnormal accumulation of the aqueous fluid, resulting in an increase of the intraocular pressure. There also occurs an accompanying enlargement of the eyeball (ox-eye). Treatment consists in establishing new drainage channels.

The primary acquired type may be chronic, in which case the disease comes on insidiously, its destructive process acting so slowly and painlessly that vision may be lost long before one is aware of its presence, or it may be ushered in suddenly with acute symptoms, such as nausea, vomiting, or precordial pain, so violent as to throw one off the track of the underlying destructive process in the eye. Secondary glaucoma results from some other disease existing in the eye and is directly attributable to the underlying pathology, be it inflammation, injury, or tumor growth.

Intraocular Pressure

The pressure in the normal eye as measured with the tonometer is between 15 and 35 millimeters of mercury. In simple chronic glaucoma the tension may fluctuate between 35 and 50. Sight in such an eye is destroyed slowly by the continuous pressure comparable to the destruction of any vital structure by slow constant strangulation. Acute glaucoma, on the other hand, reduces the vision quickly, for the tension may rise as high as a hundred millimeters of mercury. Unless in the latter type the tension is relieved quickly—within several hours after the onset of glaucoma—the vision may be permanently lost, for the interruption of the retinal circulation results in the disintegration of the sensory cells of the retina. Vision in the retinal areas damaged by glaucoma is often beyond recovery.

Anatomy of the Eye

In order to understand the mechanism of glaucoma and the methods used to relieve the eye of this devastating disease, one needs to know the anatomy of the eye in relation to the aqueous fluid, for it is in the disturbance of the balance between the secretion and excretion of this fluid that glaucoma develops (Figure 1).

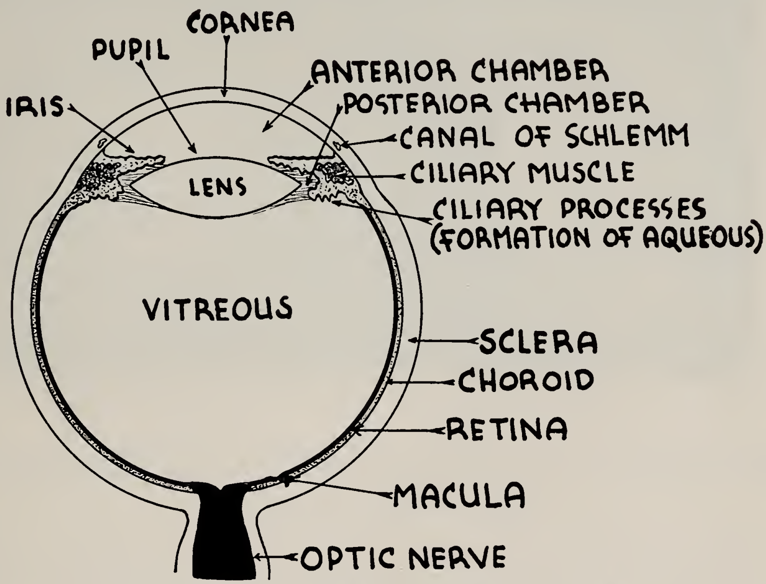


Figure 1.—Cross-section of the human eye

The outer coat (sclera), with its modified transparent structure in front (cornea), forms a tough support for the more delicate contents in the eyeball and protects these vital structures in much the same manner as the bony skull protects the brain and cranial nerves. Just within the sclera, and forming the middle coat, is the uveal tract (nutritional layer of the eyeball). The uveal tract is composed of: (1) the iris, (2) the ciliary body, divided into the ciliary processes, which secrete the aqueous fluid, and the ciliary muscle, which controls accommodation, and (3) the choroid, or the vascular structure. The innermost coat (retina) is the sensory part of the eye. It is a most delicate structure, and therefore the most vulnerable from the standpoint of disease or injury, and even slight damage results in disturbances in vision.

Since the retina possesses its own nutritional blood vessels, any interference with the retinal circulation influences sight, and this fact forms the basic cause of the loss of sight in glaucoma. The retinal vessels enter the eye with the optic nerve and extend to the outer part (periphery) of the retina (Figure 2). In the region of

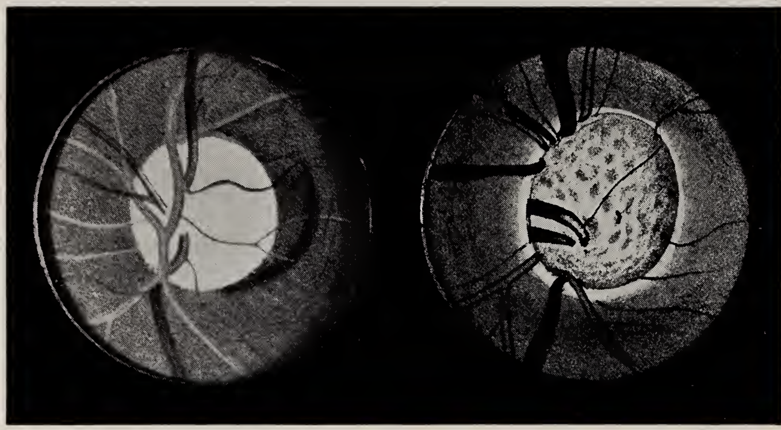


Figure 2 Figure 3

Figures 2 and 3 illustrate respectively what a doctor sees in a normal eye and a glaucomatous eye through an ophthalmoscope: 2 is a normal optic nerve head; 3 is a glaucomatous one

the optic nerve the vessels are largest, and as they extend outward the branches become smaller until in the most peripheral regions they are minute.

Within the eyeball is the vitreous body, a jelly-like substance held in place by a transparent network of tissue filaments. This structure supports the eyeball from within and prevents the eye from collapsing. Pressure exerted on the vitreous from the front of the eyeball by an accumulating aqueous fluid, which in glaucoma has deficient avenues of drainage, is transmitted in all directions and this pressure on the retina results in interference with the retinal circulation. This in turn affects the nutrition of the retina and loss of vision follows.

Physiology of Aqueous

The aqueous fluid, like all other secretions of the body, is constantly being formed and eliminated. This fluid, which brings

nourishment to the lens and surrounding structures, arises in the ciliary processes, then passes through the pupil into the anterior chamber and is largely eliminated from the eye through the canals of Schlemm at the corneoscleral junction (Figure 4). In this

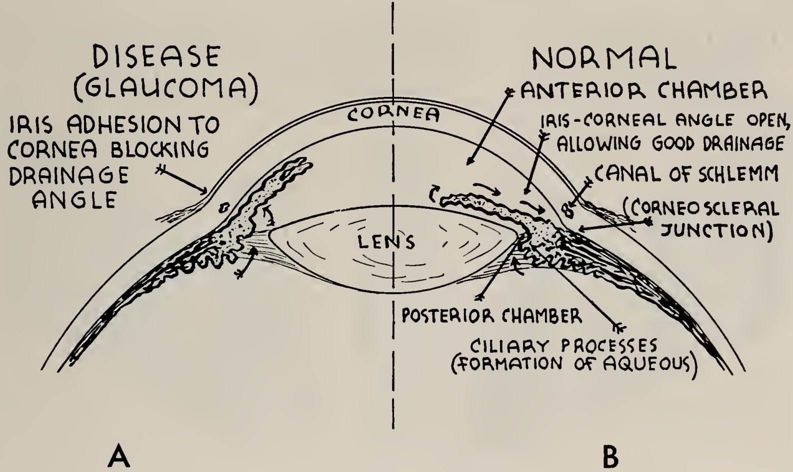


Figure 4.—Cross-section of eye, comparing glaucomatous with healthy eye: "A", glaucomatous, "B", normal. Arrows show direction of aqueous flow

region are found large veins in close relation to the canals of Schlemm and the aqueous finds its way into these venous channels. The aqueous is therefore eliminated largely through the venous circulation in the anterior part of the eyeball. The cycle of the aqueous is therefore as follows: formation in the ciliary processes, outflow through the pupil into the anterior chamber, and exit from the eye through Schlemm's canals. A small portion of the aqueous is reabsorbed into the ciliary body and iris.

Physiology of Retina

In the human eye are found two types of vision—central and peripheral (Figure 5). The former obtains in looking at an object directly, the sensory impression of the object falling upon a very small part of the retina, namely, the macula. This area is the most highly developed area in the eye. Peripheral or indirect vision is obtained when the retina outside the macular area is stimulated.

In looking at an object directly one sees indistinctly many objects above, below, and to the sides. This indirect or peripheral vision is of inestimable value in our daily activities and its impairment can readily be appreciated while driving an automobile, while working, dining with several people, or even walking.

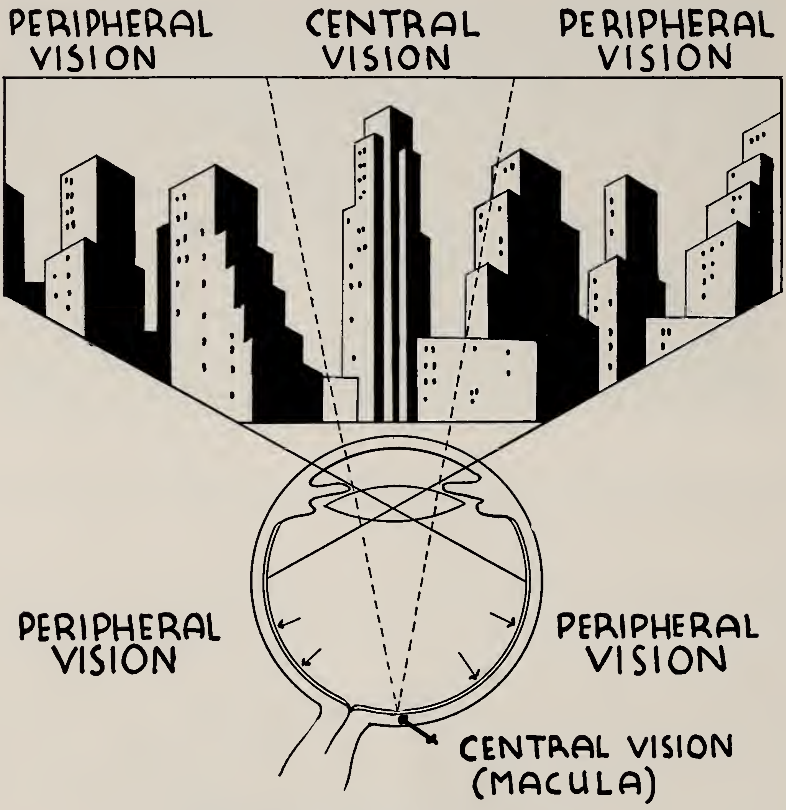


Figure 5.—What the normal eye sees

Pathology of Retina

The retina depends for its nourishment on its own circulation, and the large retinal vessels make their appearance in the eyeball with the optic nerve (Figure 2). From here they branch out and spread peripherally so that the terminal branches at the extreme periphery of the retina are the tiniest. The main trunk and branches of the retinal vessels may well be compared to a river with

its tributaries. In a very dry season the smallest streams dry up, and the soil nurtured by these streams becomes arid and barren. The larger tributaries and main channel become smaller and shallower and should the countryside be an agricultural one, poor crops and destitution follow. As the drainage of aqueous is inter-

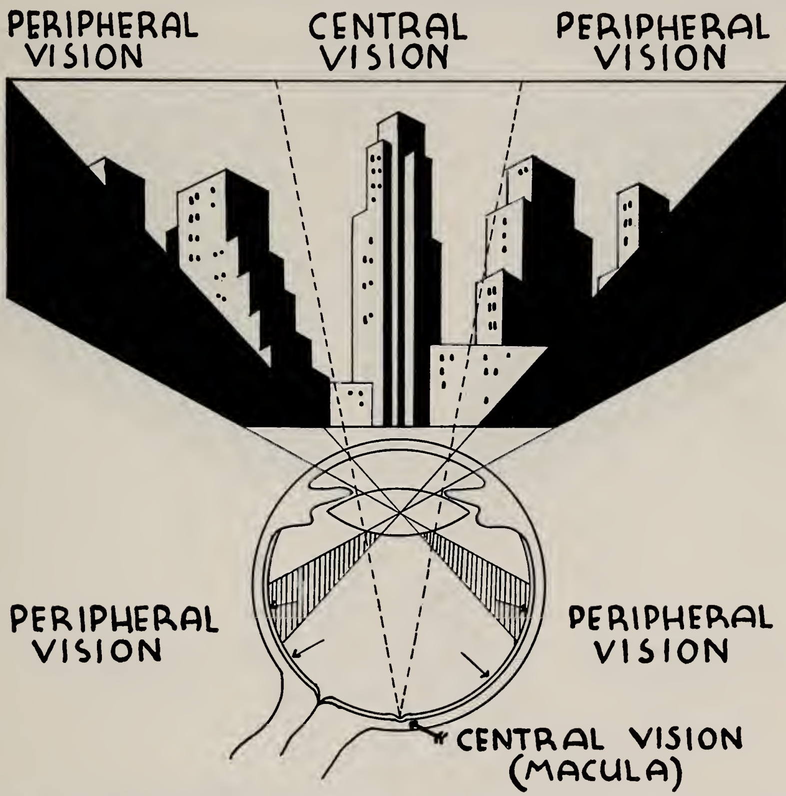


Figure 6.—Early glaucoma. Arrows show pressure on retina resulting in reduction of peripheral vision

fered with, this fluid increases in amount and exerts its pressure in all directions. Since the outer coat of the eye (sclera and cornea) is very resistant, the increased intraocular pressure soon destroys the smallest retinal vessels at the periphery and the retina in that area undergoes atrophy. Eventually the optic nerve atrophies and is pushed backward, producing the typical glaucomatous cupping (Figure 3). In glaucoma, therefore, the retina is damaged from the periphery inward toward the macula, and the peripheral

field of vision contracts (Figure 6). As the process of destruction continues, the peripheral field shrinks more and more (Figure 7) and finally disappears altogether. In such an eye the central vision alone remains (Figure 8) and this confines the visual capacity in much the same manner as obtains in looking through a tube. This limited vision is therefore called tubular vision.

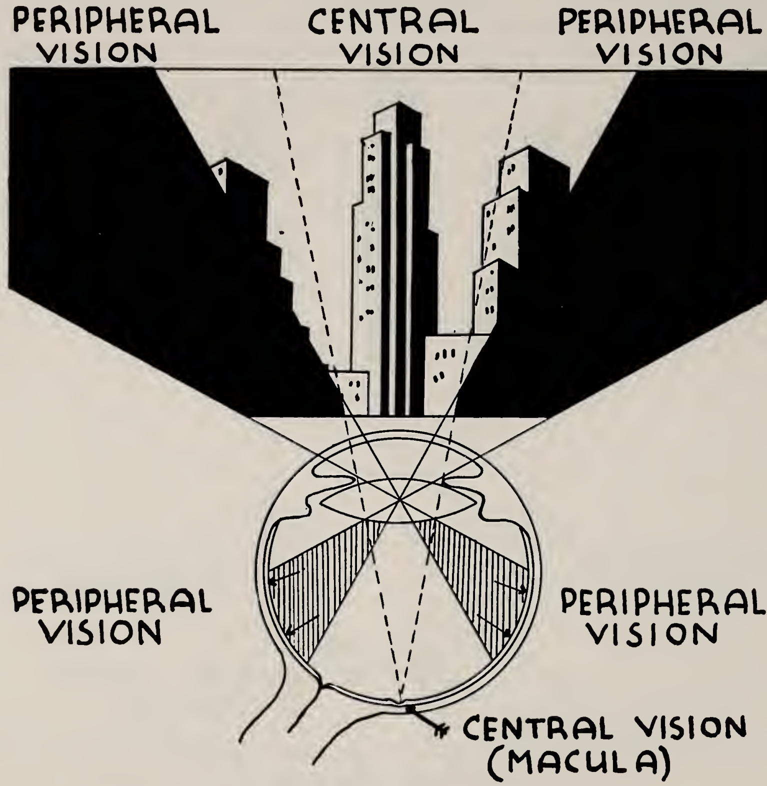


Figure 7.—Advancing glaucoma. Further reduction of peripheral vision caused by continued elevated pressure on retina

In glaucoma tubular vision may be 20/20 and as the process is long in developing and often painless, the victim may be unaware that blindness is near at hand for this central vision is all that remains. This is comparable also to the narrow strip of fertile soil along the shallow channel in a season of drought, though just

beyond the narrow fertile strip the soil is parched and unproductive, unable to maintain any plant or animal life. As the heat of the sun continues and no rain falls, there results a complete drying up of even the main channel and the river banks, too, take on the destitution of the surrounding country. In the eye, when the high

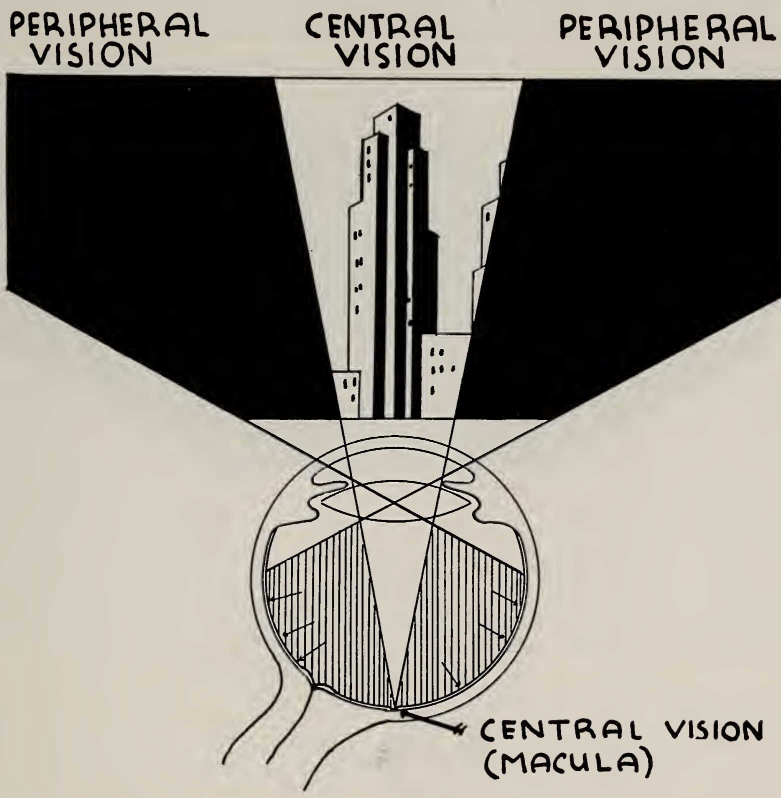


Figure 8.—Advanced glaucoma—tubular (central) vision. Peripheral fields of vision entirely destroyed

pressure continues unchanged, the main retinal vessels also are unable to withstand the increased pressure and the central vision is finally lost (Figure 9). When this last situation overtakes one, he is thrust into the darkness of night, never again to find his way back to light, for when central vision goes, the sight is irretrievably gone—an overwhelming price to pay for neglect and indifference.

Absolute glaucoma exists when sight is entirely gone and when the eyeball is of stony hardness.

Symptoms

Unfortunately, the person with the simple type of glaucoma showing the tragic picture above is often without physical dis-

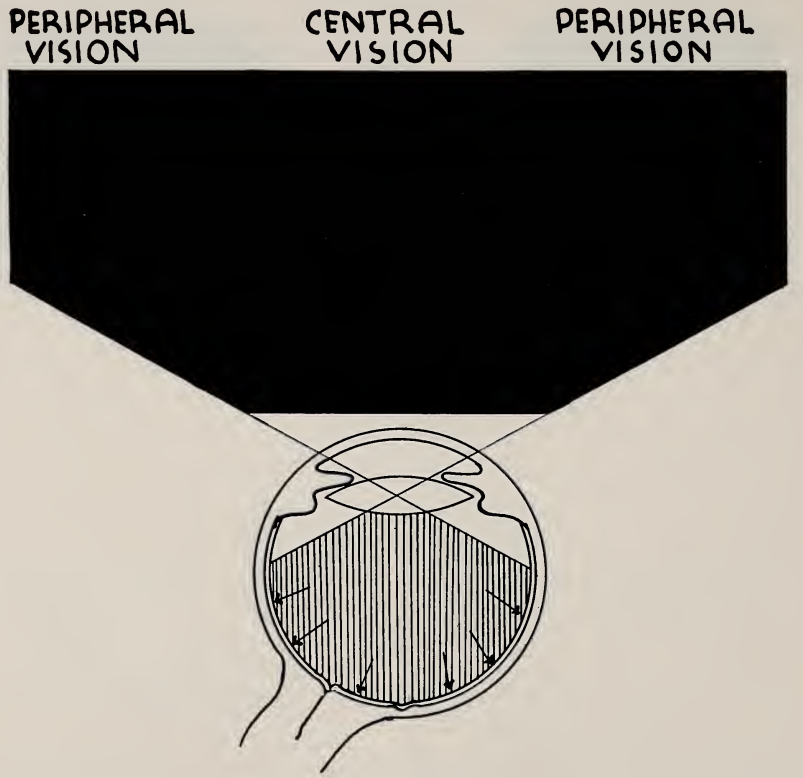


Figure 9.—Blindness—both peripheral and central fields of vision destroyed

comfort and gradual loss of vision may be the only complaint. There may be headaches, pain in and about the eyes, and halos around lights. The acute type of glaucoma may be ushered in with violent symptoms, such as nausea, vomiting, discomfort about the heart, and extreme pain in the eyes.

Treatment

Since the disease is due to an increase in the intraocular pressure, the treatment and cure lie in permanently relieving this pressure. This is done medically by instilling drugs into the eye which contract the pupil and free the drainage angle by pulling the root of the iris away from the cornea (Figure 4). Should the tension fall within normal limits with the instillation of drops and the field remain stationary, the disease may be considered checked, but in that case it is necessary to use drops in the eye daily thereafter. When the drugs do not succeed in lowering the pressure or when the pressure is lowered and visual field studies continue to show progressive contraction of the peripheral field, surgery must be resorted to. The extent of contractions of the peripheral fields, together with the duration of the disease, determines the type of operation to be performed. Since these eyes show adhesions between the iris root and cornea, thereby permanently blocking the drainage angle (Figure 4), new avenues of exit must be established for the outflow of the aqueous. In the large majority of cases, surgery succeeds in lowering the intraocular pressure by diverting the drainage of aqueous fluid into new venous channels in a way which remains permanently adequate. The disease is then said to be cured and no further damage to vision is expected. However, the visual loss which one suffered up to that time usually remains. The urgent need, therefore, in this condition is early recognition and adequate treatment.

Summary

Glaucoma is a disease of the eye, common in its occurrence and destructive in its behavior. It lends itself quite early to diagnosis and consequently to cure. One should always be aware of its presence: headaches, halos about the lights, pain in the eyes, and diminishing vision (particularly side vision) should make one suspicious of its presence. It must be attacked with understanding and vigor, for its malignant nature leaves hopeless destruction in its wake. The glaucoma patient who seeks the aid of an ophthalmologist early, carries out the doctor's advice faithfully, and remains under medical supervision permanently has a good chance of preserving his sight.

Eye Conditions Prevalent in Preschool Age*

Charles A. Hargitt, M.D.

MALNUTRITION and unhygienic environment in childhood are conducive to the susceptibility of the eye to certain diseases

IT is, of course, true of eye diseases, as it is of general diseases, that the individual child who is the victim of unhygienic surroundings and malnutrition, which may mean either insufficient nourishment, or improperly balanced nourishment, or both, is destined to be more susceptible to disease or to maldevelopment which may seriously handicap it for life than is the child in healthy surroundings.

A not uncommon condition that we find among the children, that to some extent must be associated with unhygienic living, is one called ulcerative blepharitis. This is readily recognized by the thickened lid margins, and the yellowish scales or scabs among the lashes. Some of these cases among the older children are probably associated with eyestrain and the need of glasses. If this condition is not promptly recognized and treated, it becomes chronic, resulting in permanently thickened lids, with edges more or less everted, and with scanty lashes. This means imperfect protection to the eyeball, making it easier for the eye to become traumatized, and this may result in serious impairment of vision.

Sties you are all familiar with. These are infections in the lash follicles and often form sizable abscesses. When there are frequent recurrences of them, it means a lowered general resistance to infection and probably unbalanced diet.

* Presented at the Institute on Conservation of Vision, Brooklyn, N. Y., April 16, 1936; arranged by the Bureau of Prevention of Blindness of the Division of the Blind, New York State Department of Social Welfare; and sponsored by the Eyesight Conservation Committee of the Brooklyn Health Council; Medical Society, County of Kings and Academy of Medicine; and the Brooklyn Ophthalmological Society.

The acute infections of the conjunctiva are fairly common. In general, these have no direct bearing upon the problem of diet. They do have a very definite relationship with home hygiene as they are easily spread by contact. Fortunately most of these infections are largely self-limited and result in no permanent disability. If they are recognized early and treatment instituted they usually respond very promptly. The gonococcal infections are, of course, potentially much more dangerous. These are becoming, relatively, quite rare. The typical case can, with fair certainty, be diagnosed by inspection alone. The upper lid is red, swollen and drooping, so that the globe is entirely covered. There is a thick yellow creamy pus showing between the lid margins. With prompt recognition and treatment, serious complications are the exception. Early neglect, however, may well result in destructive ulceration of the cornea, ending in serious or total loss of vision.

The diphtheritic infections of the conjunctiva have become very rare. I do not recall having seen such a case in the past ten years or more. This, of course, is directly attributable to the almost complete control of this disease that has been attained in the past few years.

Of the affections of the cornea which properly come into the general problem under discussion, perhaps the most common is the so-called eczematous or scrofulous keratitis. This again in its typical manifestation can almost surely be diagnosed by inspection alone, without touching the child. Both eyes are usually involved. The child will keep the eyes nearly closed because of the extreme photophobia, or painful sensitiveness to light. The skin at the outer angles of the lids is usually macerated. On the slightest attempt to open the eyes there is profuse tearing. The conjunctiva is red, and on the cornea will be one or more small grey spots which, in the course of the disease, usually develop eroded surfaces. If the attack is prolonged, or if there are recurrences, more or less scarring with permanent reduction of vision, is inevitable. This disease occurs often in children in whom there are evidences of tuberculosis in some form or, at least, where there is a tubercular heritage. That improper diet may be a factor is evidenced by the fact that if these children are hospitalized, where a better balanced

diet is the rule, they respond very quickly to very simple local treatment, only to suffer recurrences upon being returned to their homes. Probably a large proportion of these cases is seen among the negro children, and the incidence of tuberculosis is comparatively high in that race.

Another affection of the cornea which is definitely linked to the nutritional or dietary problem is the phlyctenular disease. This does not need much more than mention, as it is rarely serious in its threat to vision. It is characterized by small round yellowish elevations which usually appear at the junction of the cornea with the conjunctiva, and accompanied by a more or less acute inflammation localized in that region of the eye. Its relationship with the dietary problem lies in the fact that it is frequently associated with an overindulgence in carbohydrates. There is evidence that in some cases it is caused by the action of the toxins from some active tubercular process elsewhere in the body.

The most severe forms of corneal disease associated with malnutrition, fortunately, are rarely seen in this country. I refer to the disease which we call keratomalacia, which means softening of cornea. It is prevalent in China. In this disease, the whole cornea may be destroyed.

One other disease of the cornea which we still see too frequently among the preschool age children, as well as in the older children, is interstitial keratitis. This is not a nutritional problem, but a hygienic one, and bulks large in the great problem of conservation of vision. It is almost always caused by inherited syphilis, and many times it will be the first recognized sign of that disease. In the well advanced stage, the cornea loses a considerable degree of its transparency, the eye is acutely inflamed, and there is a considerable degree of photophobia. The early recognition of it and the prompt institution of treatment will, in many cases, result in a shortening of the attack and a more or less perfect restoration of the transparency of the cornea. Another very important need for its prompt recognition lies in the fact that inasmuch as this may be the first evidence of syphilis in the child, early and vigorous treatment may not only prevent serious loss of vision, but may prevent other serious developments elsewhere in the body, particularly in the nervous system.

In discussing the hereditary conditions that are seen in the young patient, I shall confine myself to infantile glaucoma and congenital cataract. In the former, the first symptom or manifestation of it, if it is not already well advanced at birth, is in the gradual but eventual marked enlargement of the globe, as compared to the other eye (it is usually confined to one eye). Then there becomes evident a bluish or slate-colored hue to the white of the eye, because the black pigment layer shows through the thinned white scleral coat. In the later stages, the cornea becomes irregularly bulging and opaque. This deforming of the eyeball is due to the fluid over-distention of the globe before the supporting walls are well developed and strong enough to withstand the tension. It is probably caused by an anomalous anatomical development which prevents the normal drainage of the intraocular fluids which are constantly being formed.

Infantile glaucoma is distinctly different in many respects from the glaucoma of adult life. They are alike in the sense that total loss of vision is the inevitable result, if not controlled. Early recognition of the infantile glaucoma is vital for two reasons. If the eye is not already blind, suitable treatment may save some sight. Even if the eye be blind, if the extreme malformation has not progressed too far, proper treatment may prevent the later necessity of removing the eye for cosmetic reasons.

Congenital cataract is another condition which has an important place in our general problem of conservation of vision. Cataract, as most of you probably know, is a disease of the lens of the eye, in which the normal transparency gives way to a developing opaqueness. Congenital cataracts are probably mostly due to some imperfect development of the eye during fetal life, which arrests the full development of the lens, or deprives it of its normal nourishment. Some of these cases are fully formed at time of birth and are recognized by the appearance of the pupil, which looks milky white instead of the usual, apparent black. Some cases of partial cataract can be easily overlooked on casual observation. The kind of treatment, if any, which is indicated in these cases depends upon the type of cataract and the degree of opaqueness present. Early removal of the fully developed cataract is

necessary if we are to prevent a permanent arrest of a useful visual sense.

Eye affections in young children resulting from focal infections are not as common as in adults. When they do occur, they are more likely to start in the posterior portions of the eye and hence may be entirely unobserved during the early or active stage. This can be so, because of absence of pain, and because the anterior half of the eye may be entirely free from any redness or inflammation. Furthermore, any disturbance of vision, particularly if limited to one eye, would probably not be noticed by the child, hence is not reported. We do, however, occasionally meet with some tragic cases in which, during some of the acute illnesses more or less common to children, an infection is carried in the blood stream to be lodged in the posterior part of the vascular coat, or in the retina of one or both eyes, there developing as an abscess, and at times resulting in total blindness.

There is another class of disease which affects young children as well as adults and may result in serious loss of vision. I refer to choroiditis, a disease of the choroid layer, and usually involving the overlying retina as well. The two most frequent causes are tuberculosis and syphilis. Many times, cases of choroiditis are not seen during the early development, as there are no external signs. It can be detected only by examination of the interior of the eye. This fact illustrates the importance of thorough examination of children's eyes at reasonable intervals, even in the absence of signs or symptoms of trouble.

There is another class of affection quite common in young children, which plays a very important part in our general problem. I refer to the cases of strabismus or squint. The most common form is the converging squint, commonly spoken of as cross-eye. These cases are usually noticed early, because of the very obvious appearance, but there are still too many parents who persist in the belief that their child will outgrow it, and nothing need be done. The more common causes of this condition are either a definite malformation in one or more of the rotating muscles of the eye, preventing a full and free rotation of the globes; a high degree of hyperopia or "farsightedness"; or an imperfect development of the fusion sense. It would require too much time to enter

into a technical explanation of these. What I do wish to emphasize is that all of these cases should be submitted for adequate examination at the first definite appearance of the squint. Many of these cases can be controlled and, in time, cured by the fitting of proper glasses when indicated, even in the very young child of two or three years of age. When this fails to accomplish the desired result, the surgical correction of the squint should not be too long delayed. The importance of this is due to the fact that our experience has taught us that a squinting eye which has remained uncorrected for an appreciable length of time may be found subsequently to have very imperfect vision; whereas after early surgical correction, followed in some cases by carefully supervised muscle training, useful or normal vision in the squinting eye may result. Many parents object to the use of glasses in small children because of their fear of injury to the eyes from accidental breaking of the lenses. The danger of this is very slight.

In considering the problem of eye injuries, I shall again speak in more or less general terms. Any form of traumatism to the eye may have serious results, in terms of vision. This can be true of seemingly trivial abrasions of the cornea, which usually heal very quickly without any impairment of function. Or a simple foreign body, embedded in the corneal surface, may through infection or delay in removal, result in ulcer formation with resultant scarring. If this takes place in the pupil area of the cornea, serious impairment of vision may result.

Any injury which causes a laceration and particularly penetration of the eyeball is always dangerous. If the lens of the eye is involved, it will almost certainly become cataractous. Or if the cornea alone is involved, there may be resulting scar formation which may result in impaired vision. Sharp pointed toys are always dangerous for children.

There is one type of injury that always involves the oculist as well as the parents or guardians in grave responsibility. I refer to the type of injuries which experience has taught us may result in sympathetic involvement of the fellow eye. It is bad enough for one eye to be seriously damaged or lost, but it is tragedy indeed when the second eye is involved in threatening inflammation which may destroy its vision also. The hardest decision that

a parent may be called upon to make, in this matter, is to consent to the removal of an injured eye in which there is still considerable vision, but this is very necessary at times. Sympathetic involvement in the second eye may not threaten until several years after the injury, but when it starts, it is then oftentimes too late to save it, even if then the injured eye be removed.

Accidents in Traffic and Industry as Related to the Psychology of Vision*

T. W. Forbes, Ph.D.

THE author discusses the factors involved in visual judgments of speed and distance, as well as in fatigue and drowsiness—factors which determine the efficiency of the driver or the industrial worker

MANY of the accidents on the highway and in industry eliminate vision completely and permanently, sometimes by eliminating the individual. Figures of the Travelers Life Insurance Company show that in the United States four per cent of the people involved in highway accidents are killed and some 18.5 per cent of the non-fatal accidents are of the type which may also involve injury to the eyes, namely, skull and brain injuries and injuries involving contusions and lacerations. The proportion of traffic accidents from psychological causes has been placed as high as 80 per cent.

In applying the psychology of vision to accidents, we are interested in the way people use their eyes, how that affects liability to accident and what remedies may be applied. In so doing we will consider both average vision and non-average vision. Pathological conditions are, of course, a medical problem. They will be discussed in this paper as briefly as possible and only as they affect behavior. There are, however, many phases of vision and wide differences in vision in medically normal eyes which affect the behavior of drivers and of industrial workers.

*Presented at the Institute on Conservation of Vision, Brooklyn, N. Y., April 16, 1936; arranged by the Bureau of Prevention of Blindness of the Division of the Blind, New York State Department of Social Welfare; and sponsored by the Eyesight Conservation Committee of the Brooklyn Health Council; Medical Society, County of Kings, and Academy of Medicine; and the Brooklyn Ophthalmological Society.

The psychological factors in vision which will be discussed are those affecting reaction time and judgments. They are the extent of the field of vision, the introduction of movements of the head for visual purposes, visual attention, the acuity of vision as it affects the psychological reaction, color-blindness, visual factors in judgment of speed and distance, susceptibility to glare, the time for adjustment or fixation of the eyes, a person's reaction time to visual impression at the periphery of the eye as against those of the fovea or center, and finally fatigue and drowsiness of the individual from visual factors. The relation of the psychology of vision to traffic accidents will receive most attention, since the speaker has been most closely related with that field.

Field of Vision

The occurrence of a narrowed field of vision in extreme cases (so-called "tunnel vision") is a source of auto accidents. The following is an extreme case:

An employee of a company which operates a fleet of cars was referred to our psychological accident clinic because of the fact that he had had several serious accidents with company cars in and about the garage. One of these was apparently almost unexplainable. He had taken a light truck to which he had been assigned and had backed it rapidly out through the garage door, squarely into the private car of one of the executives. This, of course, gained him immediate personal attention. There seemed to be absolutely no excuse for his having done this sort of thing although he claimed that he had not noticed that the car was there. He was a middle-aged man, apparently in good health, and had passed the ordinary medical examination. Upon examination he showed competence in automotive manipulation, and in all other respects until it was discovered that he had a well-defined case of "tunnel vision." In other words, he was unable to see with any degree of clearness any object more than about 10 degrees to either side of a line straight ahead of him. Here, obviously, was a man who should have been excluded from driving. We were dealing with a definitely unusual eye condition which would have been detected by a complete ophthalmological examination.

Strangely enough, however, this man had been driving a personal car for some years and, as far as we could learn, had never had a serious accident. The question then arises as to how he was able to drive privately and not commercially. The answer turned

out to be a matter of family organization. We discovered that when driving his personal car he had an agreement with his wife to cover all parts of the visual field for him except the 20 degree angle straight ahead. She therefore kept watch and took the place of the vision from the periphery of the eye which he lacked. With care, this arrangement had apparently been successful. When, however, he had been forced by his job to drive alone, he immediately figured consistently in accidents.

This case, therefore, illustrates the fact not only that a wide field of vision is very necessary for safe driving but it also illustrates the fact that a great number of people are undoubtedly driving with most unfavorable visual conditions.

The question now arises, "What factors make a wide visual field or angle of vision of crucial importance?" The function of the periphery of the retina seems to be to cause a reflex turning of the head in the direction of the objects seen. This allows focusing of the central part of the retina, with its greater acuity, on the object. It has long been known that there is a greater sensitivity for the seeing of moving objects in the edge of the visual field. It has been shown, however, that when a person is asked to respond as quickly as possible with his hand after seeing an object he responds quicker when the object is in the center of the field than he does when it is out on the edge. The reflex turning of the head and eyes, however, is much faster than the fastest eye-hand reaction to an object in the center of the field. It is thus evident that reflex turning can take place before a person can respond with brakes, clutch or horn, when an object comes into the side of the field.

It has also been shown by actual experimental study that the best drivers do not rely on "seeing out of the corner of the eye" but do actually turn their heads continuously and rapidly back and forth. They therefore bring into clear focus a very wide area in front of them. It is thus possible for a person to overcome, to some extent at least, the handicap of a slight narrowing of his field of vision.

For practical purposes, then, we are faced with the question: At what point shall narrowness of field vision be considered unsafe for auto driving and for other similar tasks in industry where moving vehicles, trains or other devices are being controlled?

This is a question which must be answered before tests of field of vision can be used for selection purposes. The answer can be obtained by the testing of individuals with psychological test apparatus, simulating as nearly as possible the conditions to be met on the road or on the job. Psychological tests of this sort have been in the process of development for some years, first at Ohio State University and more recently at Iowa State College and Harvard University.

Visual Attention

Visual attention is a psychological factor which must be reckoned with since it is quite possible for a person with perfect eyesight to be effectively blind, due to concentration of his attention on some one part of the visual field. The study above referred to showed that some accident prone auto drivers tended to make less head movements than the better drivers and observation showed that often this was due to watching some pretty girl on the side of the street, intently. Such intent visual focus can be shown in the laboratory to produce effective blindness for everything else in the visual field, that is, a person will not be able to report other objects which he would otherwise undoubtedly see. In safety education campaigns, therefore, people should be advised to move their gaze over the various parts of the field continuously in order to guard against such concentrated attention.

Myopia

Uncorrected nearsightedness of the less severe sort probably affects the behavior of the driver mostly in connection with the reading of signs. He must slow down or stop and thus impede traffic. He may also get into the wrong lane for a turn because he is unable to read a sign, and then at the last minute jerk his car across in front of traffic causing at worst, a bad smash, or at best the screeching of brakes and exercise of the well-known automobile temper and vocabulary.

Color Vision

Color blindness is a factor which has been taken into account by the traffic engineers but which is still a factor in traffic control and

accidents. The most common type of color blindness is, of course, the inability to see red and green, and the less common one is the inability to see blue and yellow. Inclusion of yellow in the red traffic signal and blue in the green signal has been designed to aid the red-green blind people in seeing traffic signals and is a distinct advance. However, to the color-blind driver, one of the predominant characteristics of a colored light is its brightness value. That is, instead of seeing red and green he sees a dark and a light gray. The difference in these lights becomes less as the intensity of both lights becomes weaker, that is when the light is quite a distance away. The more severely color-blind person may therefore be able to tell the difference between the red and green close at hand but may not be able to distinguish them at three or four blocks distance when the lights are spaced as they are in Manhattan, for instance. The recommendation which has been made by the traffic engineers, that the red light be always kept in the same relative position, helps this situation materially and should be made universal.

A second color vision factor which applies not only to the color blind but to the normal individual is the question of differentiating signal lights from surrounding lights. This difficulty becomes quite obvious if one is driving down a city street with lighted store windows on both sides and looking three or four blocks ahead to a light situated among a cluster of red Neon signs. It may be practically impossible to tell whether there is a red signal showing or not. Laboratory tests have shown that reaction time is very much slower to a visual signal when the visual signal is being discriminated from other ones which are very similar to it. Thus the situation mentioned is the poorest possible one for producing a quick response in the driver, even if the driver is concentrating and trying to respond quickly.

In industry the situation can be fairly easily overcome, since surrounding lights can be controlled and their color chosen to be quite different from signal lights. In city traffic, however, the solution is less easy to prescribe. A semaphore type of signal light, somewhat similar to those used in certain railroad block signals, might be one solution but would probably be prohibitive in cost. A better solution might be to require all store signs and lights to

be shielded from the side so as not to be visible to the driver who is over a block away.

Color Contrast and Legibility of Road Signs

Color contrast has been extensively investigated in connection with advertising signs and also to some extent in connection with road signs. Black on white and black on yellow give the best legibility. Also simple diagrammatic signs are read more quickly than ones containing verbal material. This has been shown most effectively by presenting different types of material in a quick exposure device known as the tachistoscope and measuring the actual time of exposure necessary for reading.

As suggested in connection with nearsightedness, road signs and possibly advertising signs may be causes of accidents in as far as they distract visual attention from the road.

Visual Judgment of Distance and Speed

Another very important psychological response which is definitely dependent on vision is the recognition of objects, the judgment of their distance away and their speed and direction. This is obviously important in driving and also enters in certain industrial jobs and processes. For instance, a person may round a corner or curve at fair speed and come upon a truck. He must know in a fraction of a second whether the truck is moving ahead at 40 miles an hour, at 10 or 15 miles an hour, stopped, or actually backing up.

Such recognition and judgment in daylight depend on the visual impression of changing shape and size of the object or vehicle, changing shadows, the visual disparity or difference in the pictures obtained by the two eyes, and seeing the object or vehicle pass other objects. The judging of objects closer than 20 feet, which is necessary in some industrial tasks, also depends on the reflex responses of the pupils of the eye and on convergence. The one-eyed individual is at a distinct disadvantage because of the lack of the binocular effect and therefore cannot judge distance and speed as accurately and as easily as the normal individual.

In poor illumination such judgments are hampered by the loss

of distinct outlines of shape and size and the loss of the effect from shadows. Through a long process of learning to judge visual distance under normal conditions, the object is judged as being far away and larger than it actually is when it is dim. From this comes the well known and startling effect of vehicles looming up out of the fog or mist, apparently very suddenly. They appear to be at quite a distance until very close when one suddenly realizes their nearness. Veterans on the sea and railroads know this fact and are suspicious of their judgments under these conditions. The ordinary auto driver, however, is likely not to be familiar with this effect and to be fooled by it.

Visual judgments of speed are at best uncertain as shown by the fact that even in good light visual cues may be overcome by an erroneous idea or expectancy of speed or distance. This is the sort of thing that occurs when one drives up on the open road behind a bus or truck which is moving very slowly, but which was thought to be moving faster. One often finds it necessary to use brakes in such a situation when he did not expect to. In some experimental work of my own some years ago, individuals were asked to judge the point at which an oncoming car would be met and, again and again, serious misjudgments occurred. For instance, a car which was being driven rapidly was judged as going slowly because as the person being tested said later he "thought that it probably would be going slow." Errors as great as 50 yards were made and the most frequent error was 8 to 10 yards. A study from Germany reports similar results. These results emphasize the hazard of stopping one's own car dead or backing where other drivers or operators of other moving objects or devices do not expect such a stop. Accidents from putting on brakes too suddenly at intersections fall in this class also.

The operator whose ability to make visual judgments of distance is poor, of course, runs the most chance of accident under the circumstances just mentioned. One of the most hair-raising afternoons I have ever spent was with such a driver. He was driving me some distance and I made the error of discussing judgments of speed and distance. His driving had been fair except that in a too frequent number of cases an oncoming car had caught us just about to pass and brakes had to be slammed on to prevent hitting the

car ahead of us. It was apparent that his judgment of visual distance was not of the best.

Upon my remark that the tests showed that most people do not make judgments of visual speed with any too much accuracy, however, he undertook to show me that he at least, could. From then on I regretted the remark. We would hurtle up behind a car and continue our speed long after it was apparent that there was not room to pass. The driver still thought he could get by, but about the time a crash looked inevitable he would discover his error and slam on the brakes. If one of the cars ahead had changed speed or the tires had struck a smooth spot there would certainly have been an accident. May I emphasize—this was not intentional recklessness. And in the end the driver was still unconvinced.

One of the advantages of the psychological testing method is that you can show a man how he stacks up against others in visual judgments, and do it without risking your own life. In general, these studies indicate that the average person should expect to make a very considerable error in visual judgments of speed on the open road. The average driver should be educated not to pass if the margin is at all close and he desires to enjoy his next meal.

At night, judgments must be made on a very much reduced visual basis. Only the sight of the vehicle passing other objects and a very shadowy outline of size and shape is left, together with a judgment based on the brightness of the light that the other car carried. Small size is normally associated with distance and similarly with dimness. Therefore a small dim light tends to be judged as farther away than it is. For this reason one may suddenly discover that an apparently distant car is actually one close at hand and coming at a fast clip, if it happens to be an ancient junk with small dim lights or perhaps a newer model running with cowl lights only.

There is also at times a possibility not only of mistakes in judging speed and distance, but even in recognizing an object or situation correctly. I saw a car last summer in which a driver had taken at high speed an opening into a field instead of the road. The car had rolled over several times and the driver, by a miracle, survived to go to a hospital. There have been probably many such accidents to drivers on unfamiliar roads which were fatal so that their cause

will never be known. Reduced speed on unknown and poorly marked territory is the only answer on the driver's part. The highway departments are showing commendable attention to this factor by supplementing warning lights with black and white checkering and diagrammatic signs.

Susceptibility to and Recovery from Glare

Glare has received quite a bit of attention from the engineering point of view and therefore has been widely recognized as a problem. For instance, windshields have been tilted to reduce glare from lights in the rear. There is also a physiological and psychological problem in glare. In general, glare leads to fatigue and also may cause accidents from temporary blindness. It can be shown in the laboratory that some people are able to see practically nothing when faced with a bright light, except what is illuminated by that same light. Others, on the other hand, are able to see a good deal more of the objects behind or beside the approaching light. In other words, there are wide individual differences in susceptibility to glare in apparently normal eyes.

There are also differences in the speed of recovery from glare. This is largely due to the speed of action of the muscle controlling the pupil of the eye. As everyone knows, the pupil contracts when a bright light falls on the eye; when the light is turned off or passes by, the muscle relaxes and the pupil again expands. In the contracted condition insufficient light enters the eye from dim objects for them to be seen, whereas after the pupil has dilated again a greater amount of light enters from these dim objects and they become visible. This effect is familiar to everyone in every day life, as illustrated by throwing a bright light on a screen covered window. When the screen is highly illuminated the pupil contracts and persons or objects behind the screen become invisible, although when the light is thrown off the screen, they may be quite plainly visible. Direct glare or glare on a windshield, either from approaching light or from light in the rear, has exactly this effect. It is known that the speed of the pupillary response varies among individuals and shows toward slowing with age.

Let us, to be conservative, say that drivers are effectively or partially glare blind for about a half of a second in passing another

car on the road at night, with the cars traveling at 50 to 60 miles an hour. This means that each car travels about 44 feet during this time. It has also been shown in several studies that it takes from 0.3 to 0.5 of a second to press the brake after seeing a signal; that is, a person's visual-brake reaction time is of this magnitude. Therefore between seeing a pedestrian and pressing the brake the car will travel from 26 to 44 feet, depending on the reaction speed of the individual concerned, and after that the time actually to stop the car must be added. It is therefore obvious that glare blindness and reaction time add something like 70 to 90 feet to the time shown by the engineers for actually bringing the car to a stop at 60 miles an hour after the brakes are applied.

The range of time of glare blindness, the degree of blindness of different individuals and the time for recovery of different individuals are being studied at present. One of the interesting features of giving tests of this sort is that although some individuals are aware that they are unusually glare blind and will say so, others are surprised to find that they cannot see objects as clearly around the oncoming light as do others, and yet they are passing cars just as fast as are the other drivers. The use of polarized light in automobile headlights, which has been recently suggested, seems to offer a possible solution for this difficulty in connection with automobile driving. It is possible that a similar system could also be applied in industry in situations where the worker is obliged to face the glare. The system suggested simply proposes that the light be treated by polarization so that each driver is sensitive mainly to his own light and therefore the glare of the oncoming light is greatly reduced. Objects illuminated by his own headlights in this fashion become brighter than those in the beam of the oncoming car and he has therefore good vision of the road ahead. Until such a system can be devised and made practicable, however, the only method of avoiding glare is to keep as much as possible of the oncoming light away from the pupil and the retina. The practice of watching the side of the road and the deflection of the approaching beam are methods of doing this. The unusually glare blind driver should be warned of his handicap and should cut speed on passing. And finally, the pedestrian public should be warned that the motorist often cannot see him even though he is

highly illuminated by the driver's own light. The same glare blindness also affects the pedestrian, of course.

Glare in industry has been shown to produce fatigue and to decrease output. Bright reflections from moving parts are one source of such glare. It has been found possible to increase output and decrease accidents by putting a dull finish on such bright surfaces. Other situations where glare occurs, of course, are in connection with the high temperature furnaces, arc welding, and even a clear glass window in a normally illuminated shop. Luckiesh estimates the average clear glass window in bright sunlight at ten times the intensity recommended for artificial illumination of interiors. Methods of eliminating glare in these situations have been worked out and must, of course, be fitted to the requirements of each industrial situation.

Fatigue from Bright Lights in the Periphery

It has also been shown that an unshaded light which in itself may not be especially intense but which is seen in the edge of the visual field rather than directly in front of the person, tends to cause a great deal of fatigue. This fatigue is much greater than if the same amount of light is thrown on a surface on which the person is working. The reflex turning of the eyes which is produced by a stimulus falling on the edge of the retina is apparently responsible for this fatigue. It will be remembered that this reflex was mentioned before in connection with the turning of the head in driving. In the industrial situation the worker may be forced to keep his head and eyes trained on the work which he is doing. At least this is usually the desirable situation. He therefore has a bright light at the periphery which tends to produce eye movements and possible head movements toward it and at the same time he must prevent these reflex movements and keep his vision centered on the work. Such a condition causes not only physical but probably nervous strain as well. It is therefore not surprising that increased output and a reduction in accidents have been obtained by shielding such bright points of light in the periphery of the visual field. A similar effect occurs in driving on a lighted street or road where, one after another, bright unshaded street lights travel across the periphery.

Drowsiness and Sleep

It may seem a little far afield to discuss sleep. However, if we rule out ordinary physical fatigue, and physiological rhythms, the induction of sleep may become largely a visual problem and sleep is, in certain situations, an obvious cause of accidents. One of the experimental methods of inducing sleep in the laboratory is to turn on a fairly bright light a little above and in front of the person's eyes and to tell him to look continuously at it. If the individual is just left alone and follows directions, or if he is made to do a more or less monotonous task at the same time, drowsiness soon sets in.

One of the predominating factors involved here seems to be ocular fatigue. Glare produces fatigue, as we have just mentioned, and so do bright sources in the periphery of the field. Still another source of fatigue, which has been discussed again and again by the ophthalmologist and by the illuminating engineer, is eyestrain from under-illumination. This is especially important in work where reading or other fine work is involved, such as clerical work, needlework, and so on.

The psychological background of this effect is interesting and has been studied in detail in connection with reading. By photographing eye movements it has been shown that in reading, the eye jumps along the line from spot to spot, taking in two or three words at each jump. The actual seeing process occurs during stops, and if illumination is poor, longer stops are necessary. Furthermore, when the object is indistinct the eye tries to focus better and since it cannot, muscular tension and eye fatigue develop. Increasing illumination allows the person to see the material in shorter and shorter stops until he reaches the shortest stop that it is possible for the eye to make. Increasing the intensity therefore increases the speed of seeing up to a certain point. A further increase of intensity beyond that point does not increase the actual effective speed with which reading can be done and it begins to introduce the detrimental effects from glare.

All these visual factors which produce fatigue tend to bring on drowsiness. The worker or driver may not go entirely to sleep but may find himself unable to prevent fitful dozing. In this state bordering on sleep, the speed with which a person can respond to a

situation is very definitely reduced, as shown by reaction time measurements, and anyone who has driven with a person who is thus dozing knows how the car starts toward the ditch or toward the middle of the road from time to time. In case a culvert happens to be situated at the point where one of these swerves occurs, there is an accident and possibly fatalities.

The worker who is in this condition of sleep-borderland may allow a tool to slip, may not notice a warning signal, may forget to turn a valve. It is therefore highly important to eliminate these sleep-inducing visual factors.

Summary

In summary, the attempt has been made to point out the various factors which have been shown to be involved in reactions of the individual to visually perceived objects and signals, which are involved in visual judgments of speed and distance, and visual factors which are involved in fatigue and drowsiness. These factors thus in part determine the behavior of the driver or the industrial worker, and his liability to cause accidents to himself or others.

Studies on some of these factors, especially as they enter in highway safety, are now in progress at several universities but much remains to be done in respect to other factors. It is hoped that interest may have been aroused in research and preventive work along these lines.

Telescopic Spectacles

Willis S. Knighton, M.D.

A BRIEF description of spectacles designed on the principles of the telescope, which may be used upon prescription of the ophthalmologist by a limited number of visually handicapped who otherwise would function as blind people

THE telescope was discovered by Metius in 1608—over three hundred years ago—and from 1646 on many attempts have been made to correct poor vision by means of its magnifying principle.* A great deal has been accomplished in recent years, especially since the advent of the Zeiss spectacle in 1909, and remarkable results have been obtained in appropriate cases. Many patients have been taught to get around with greater facility while others have been enabled to read again. Where the vision has been brought back to economic usefulness, a seeming miracle has been performed.

Perhaps it would seem a simple matter to improve the vision by magnifying all objects, but many obstacles have to be overcome before the patient can wear such a spectacle with comfort and obtain any benefit. There are mechanical and optical difficulties of construction and design which need not concern us too much. But we must appreciate the fact that the patient is being introduced to an entirely new world of vision that is often confusing as the direct result of the limitations of this optical system. Unless he can learn to adapt himself, he will not be helped.

Telescopic spectacles must be light in weight, comfortable, and not too conspicuous. In addition, they must have a flat field of good size, practical magnification, and a minimum of optical errors, such as spherical and chromatic aberration, coma, astigmatism, curvature of field and distortion. Altogether, the designer

* The names and accomplishments of the pioneers will be found in medical treatises on the subject.

has very little degree of freedom, but by judicious manipulation of the optical composition, shape, and spacing of the lenses he is able to produce a thoroughly satisfactory magnifying system.

The Galilean telescopic system is best adapted to the use of spectacles. It consists of but two lenses, a converging lens on the object side, and a diverging lens on the eye side. Since the difference in their focal lengths determines the separation of these

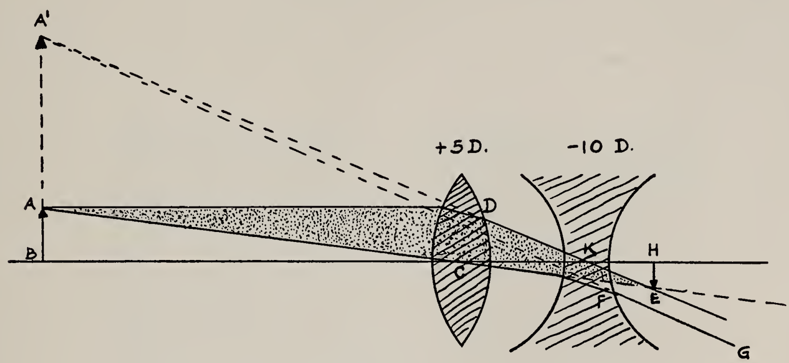


Figure 1

Rays from the object AB are converged by the first lens and then diverged by the second lens so that an enlarged erect image is formed at A′B. A ray from A going through C would continue unchanged to E if the diverging lens were not there. Another ray AD parallel to the axis would pass through K, the posterior focus, and meet the first ray at E, where an inverted image would be formed. When the diverging lens is placed at K, the ray DE is left unchanged (K is also the optical center of the diverging lens), but the ray ACE is diverted to G. The projections of the rays DE and FG meet at A′ forming the final image A′B erect and magnified. The reader may form a simple telescope by holding a +5 D. sphere and a −10 D. sphere before the eye in the position indicated. The Eggers folding telescopic spectacles are made by using these lenses at a separation of about 9 cm.

lenses, the length of the telescopic spectacles is held at a minimum. The weight of the frame with lenses is about 30 grams, or slightly more than an ounce.

The field of view is of great importance. It must be large enough to give the patient a fairly good angle of vision for distance or for reading, and yet it must be kept within certain limits to avoid exaggeration of the optical defects incident to such a system. Unfortunately all of these defects increase directly with the amount of magnification used, and experience seems to show that from 1.3 x to 1.8 x is the most practical magnification for distance. In the Zeiss form of telescopic spectacle a field of 40 degrees is

obtained with a magnification of 1.3 x but in order to obtain a magnification of 1.8 x this field must be reduced to 24 degrees. In the Kollmorgen spectacles a relatively large field of 35 degrees is obtained with a magnification of 1.7 x but the correction of the optical aberrations is somewhat slighted, on the theory that patients with poor vision do not notice small deficiencies.*

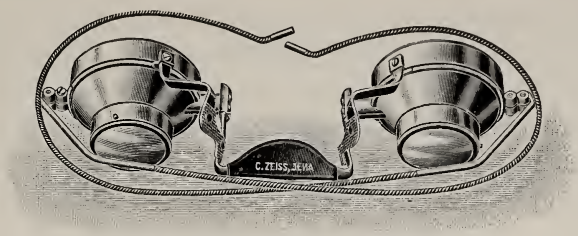
It will be noted that the enlarged image is formed *in the plane of the object.* (See Figure 1.) Theoretically the patient should see the image where the object is, but because of habit and association he invariably feels that the object is brought closer when the image is larger. Magnification causes the image to move faster than the object, and every turn of the head makes a fixed object appear to move in space. If the magnification is too great, it becomes difficult to hold the head steady enough for comfortable observation, and spatial relationships are confusing.

In close work the patient is confronted by still other problems. The same telescopic spectacle cannot be used for distance and for near vision; ordinary accommodation (ability to focus) will not suffice for near when the distance elements are before the eye. An additional converging lens must be used, either in conjunction with the eye-piece or in a mount to be slipped over the object lens. The latter is the more common procedure. Furthermore, if both eyes are being used, the axes of the two telescopes must be turned in to correspond to the converging of the eyes and the spectacles must be centered and tilted for the reading position.

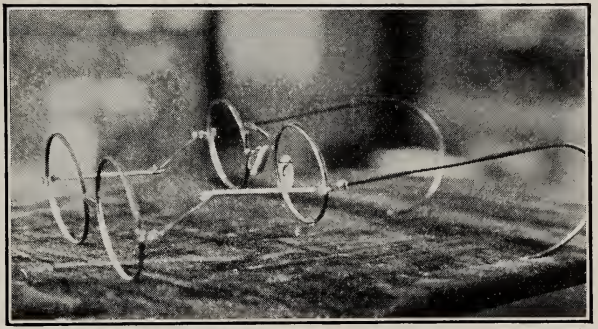
If the visual acuity is so low that a strong reading addition has to be made, close work is practically impossible with two eyes because of the magnitude of this converging angle. In this case the distance spectacles may be used if the reading attachment is placed over one of the telescopes and a dummy is used to cover the other.

The magnification for near is the same as that for distance when a 4 D. reading addition is used; it becomes greater with the increase in strength of the reading addition and may be as much as

* The Kollmorgen Optical Co. recently manufactured a telescopic spectacle with a magnification of 1.3 x in the vertical and 1.8 x in the horizontal. The idea was that the patient would get the benefit of the greater magnification in the horizontal but would refer all images back to the plane of the lesser magnification, thereby lessening the effect of nearness of objects and their apparent movement in space. This was the "wonder spectacle" that was exploited so avidly by the radio and press. It did not fulfil expectations and today even its designer is using it less and less frequently.



Zeiss Telescopic Spectacles



Courtesy of Theo. E. Ohrig

Egger's Telescopic Spectacles

Courtesy of Theo. E. Ohrig

Kollmorgen Telescopic Spectacles

4.5 x.* This is an advantage in that it may be the means of enabling the patient to read, but it introduces new limitations. As the strength of the reading addition is increased, the reading distance becomes shorter, the field of vision is narrowed, and the depth of focus is decreased. That means that the patient must hold his reading at a definite short distance from his eyes, he can see only a few words at a time, and if he moves his head the print will go out of focus. He may have to learn to read by holding his head perfectly still and moving the paper.

Before fitting telescopic spectacles it is absolutely essential that the patient's refractive error (myopia, hyperopia, or astigmatism) be fully corrected. Without this correction, the circles of diffusion created by the refractive error will be magnified and the patient

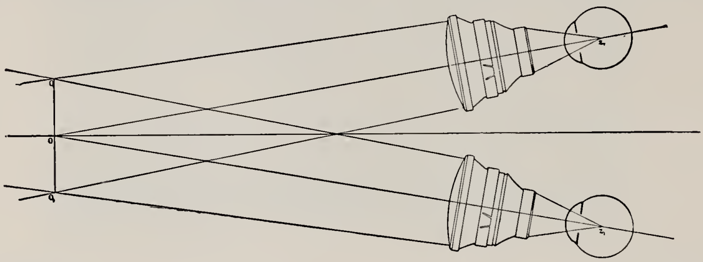


Figure 2.—Converged position of two telescopic units designed for binocular reading vision

might actually see better without the telescopic spectacles. Failure to observe this fundamental principle has caused many disappointments. The manner of adding this correction during the examination differs according to the make of telescopic spectacle used.

The necessity of centering the lenses for both distance and near cannot be emphasized too strongly. This is particularly true when binocular vision is attempted. The near lenses must also be tilted and converged, as mentioned before. Otherwise the patient will complain of color fringes, indistinct images and perhaps double vision due to the difficulty of fusing the images for the two eyes. Continual adjustment will be found necessary for comfort and for good vision.

* A microscopic lens has been devised which uses the microscopic rather than the telescopic principle. It may give as much as 25 x magnification, but it necessitates holding the reading so close as to be impractical except for the most deficient visual acuity.

The ophthalmologist has no way of telling beforehand whether telescopic spectacles will help the patient or not, except in the presence of pathology which has obviously vitiated the eye as an optical instrument. It therefore behooves him to see that all his patients with subnormal vision have an opportunity to discover whether it can be improved, unless his examination of the eye indicates that increased visual effort would be detrimental. The visual acuity is sometimes greatly increased, out of proportion to the magnification of the system. In these cases, it would seem that the enlarged image is made to fall upon retinal elements which have not been involved in the disease process.

It has been found that a patient with a vision of 20/400 or less can orient himself and get around the streets, but that he requires 20/40 for reading and writing. That would seem to indicate that a telescopic spectacle of 1.8 x magnification would not permit reading unless the patient had an initial corrected vision of about 20/60. Such is not the case, because of the extra magnification obtained with the higher reading additions, and the spectacles have been prescribed successfully for patients with a normally corrected vision as low as 20/200.

The success of telescopic spectacles depends upon many factors. Even after improvement in vision has been demonstrated, the patient may reject the idea of wearing them because of vanity or expense. If he does accept them, he must be made to realize the necessity of full co-operation with the ophthalmologist and with the optician. It is exceptional for a patient to feel comfortable and satisfied from the very first. Continual adjustments will be necessary and will require frequent visits to the optician. After the first exhilaration has worn off, patients complain that they cannot see so well, but if they are warned not to expect too much, and are carefully instructed in the way to use the lenses, they gradually improve. Often, when the vision is there, the patient must be educated again to appreciate it. If he persists he will learn to adapt himself to the new perspective.

The ophthalmologist must understand and sympathize. He can give great mental encouragement to many who think they are going blind. Indefatigable patience in testing, teaching and explaining will be well rewarded in the rehabilitation of the patient.

The Eye in Industry*

James H. Andrew, M.D., F.A.C.S.

FROM the point of view of safety in industry, it is not only important to provide safeguards, goggles, and adequate lighting, but eye inspection upon employment as well as periodically, in order that accidents may not be incurred through defective vision

IT may seem a truism to say that without eyes there could be no industry. It may seem equally absurd to state that without light the best eyes are useless. Yet upon these two facts depends the entire industrial fabric, and not that alone, but life itself.

As I see it, this subject of the eyes in industry may be well divided into three groups: First, in its relation to the employer; second, in its relation to the employee; third, in its medico-legal aspect.

The Employer's Responsibility

The great source of light is the sun. Man, in the process of evolution, adapted his eyes to the sunlight, and it became for human beings the most perfect illumination. During the ages, and keeping pace with his social, spiritual, and material uplift, man has utilized his ingenuity in producing artificial methods of illumination. With the changes produced by the advance of modern industrial civilization, many forms of light have been invented to take care of individual requirements. Crowding has taken place in great centers of industry so that our buildings have become ever higher and higher and closer together, shutting out the most perfect light, that of the sun, so that it has become neces-

* Presented at the Institute on Conservation of Vision, Brooklyn, N. Y., April 16, 1936; arranged by the Bureau of Prevention of Blindness of the Division of the Blind, New York State Department of Social Welfare; and sponsored by the Eyesight Conservation Committee of the Brooklyn Health Council; Medical Society, County of Kings and Academy of Medicine; and the Brooklyn Ophthalmological Society.

sary to replace it with light from other sources. This in itself has produced problems of which the aboriginal man never dreamed. Then again, modern civilized man uses his eyes constantly for work close to him, a condition for which the human eye is not perfectly adapted. So we are constantly forced to use our eyes in a way nature did not intend, under lighting conditions which are at best not perfect.

We know that fatigue is a common cause of disease, and fatigue of the eyes is a principal factor in many industrial accidents. It is a cause of much inefficiency in workers, from headache, loss of time, spoiling of materials, etc. Consequently, it is a source of direct monetary loss to both employer and employee. It is only comparatively recently that much attention has been paid to the conditions under which our eyes are to be used. Light may be so dim that objects can be seen only with difficulty, or it may be so strong that it exhausts the powers of the retina to a point where the eye is totally incapacitated. We try to reach a happy medium where our work can be well done with as little fatigue as possible. But, remember that we cannot judge by the brightness of the light alone, but by its effect on the individual while working at his particular task. We have instruments for measuring the amount of light, but in the last analysis the effect of the light on the individual is the final test. Some eyes require more light than others, particularly with advancing years, and some occupations require more light than others.

The pupil of the eye dilates or contracts automatically to allow just so much light to fall on the retina, but a sudden change from a bright light to a dim one, or vice versa, causes a marked failing of visual power for an appreciable time. The intensity of a light depends also on the luminosity of surrounding objects. The light of a match in a dark room may be positively painful; an automobile headlight at night is another common illustration of this fact. It is a mistake, therefore, to attempt work with a bright light shining in the eyes. Daylight reduces shadows to a minimum because it is so thoroughly diffused. Artificial light, because of its great intensity and poor diffusion, causes deep shadows; and these deep shadows are sometimes the cause of industrial accidents. If light falls directly into the eye, or is reflected into it

from a polished surface—a condition known as glare—the effect is the same. And glare is particularly bad when it strikes the eyes from below, as from polished desks, polished machinery, or water.

A factory, where land is cheap, built of one story with saw-tooth skylights facing the north, as you have sometimes seen, is almost ideal, as northern light is more uniform throughout the year and has a great volume but not a high intensity. Our modern illuminating engineers have done much to reduce the intensity of electric light and increase its diffusion, making conditions more nearly approximating a good north light. So if you contemplate putting up new office buildings or factories, or remodeling old ones, it is well to get advice about the lighting from a competent illuminating engineer.

Another contributing cause of suffering, loss of time, spoiling of material, compensation, etc., is faulty vision. How often do we employ workers, particularly those whose occupations are hazardous, without knowing the condition of their eyes? How much worry, suffering, and litigation could be avoided if we knew the condition of each worker's eyes before employing him? For example, you employ a color-blind chauffeur; he passes a red light not realizing that it is red, strikes another car or a pedestrian, causing a loss of life. Would not it have been better to have known about that color-blindness, and saved life and money by employing another man whose eyesight was good? Suppose you employ a mechanic to work on a complicated machine, and find out after much work has been ruined that the man sees well with only one eye as so many of us do, and has no depth perception. Would not it have been better to have known the condition of his eyes beforehand and saved money, material, and perhaps a ruined machine by giving him a job where fine distinctions were not necessary? In certain diseases the fields of vision are restricted; the patient can see only directly ahead but not to the sides. Such a condition is particularly hazardous because of danger to bystanders as well as to the individual himself. A comparatively few large industrial concerns do examine their applicants' eyes before they employ them, and then have them re-examined periodically, but I believe such concerns to be in the

minority. I fancy they find it cheaper to lock the barn before the horse is stolen. When I speak of examining the applicants' eyes, I do not mean a perfunctory examination for glasses by an eye-glass vendor but insist that such an examination should be made by a qualified physician whose training enables him to detect diseases of the eyes, in their incipiency. I should also advise that records be permanently kept of the condition of the eyes, noting every abnormality. I shall refer to this under the medico-legal aspect.

From the Point of View of the Employee

Now let us take the point of view of the employee. After the most careful examination and correction of his eyes, working in a shop where every precaution against accident is taken, we know that occasionally, in spite of fate, accidents do happen. They may be trivial or they may be serious. From a humanitarian point of view—to say nothing of the economic one—a faithful worker deserves the best care that we can give him. The majority of such accidents are fortunately trivial, and can be avoided by any one who will take the trouble to learn a little first aid. It is needless to say that serious accidents, or even those that are questionable, should be placed in the hands of physicians specially trained to care for the eyes.

The commonest form of injury is the ordinary speck of dirt, or emery, or whatnot that lodges on the eyeball or gets under the eyelid. These accidents may cause the most acute suffering, and by reason of infection carried with the foreign body, or by reason of germs getting into the abrasion that such substances cause, serious ulcers of the cornea may and do occur, with loss of the eye. There is usually some workman in every shop skilled in removal of such particles, using a sharply pointed knife, sharp nail, or some other object. Sometimes this knife or nail is carried in his hip pocket along with his chewing tobacco or dirty handkerchief. Needless to say, such instruments are never sterile and may cause infection in an eye which would be otherwise safe. Do not let Bill or Jack fool with these foreign bodies with his knife or nail. Such attempts should be followed by instant dismissal. A little piece of sterile cotton wound tightly on a toothpick will

usually remove specks easily—even the corner of a clean handkerchief will do. Turning over the upper eyelid to brush off particles adhering to its under side is easily learned, and everybody should know how to do it. If the particle does not come away easily, the patient should be put in expert hands.

All sorts of grinding and polishing processes are liable to cause eye injuries, usually of a superficial character. Bits of steel, emery, or polishing powders may get into the eye. These can be taken care of by removal as suggested before, washing, etc. It is always safe to put a drop of the ordinary 2 per cent mercurochrome solution in these eyes. This has the advantage of being found in many shops, is perfectly safe to use, and is a fair antiseptic. Its disadvantage is that it colors the skin red, but this stain is easily removed by water if done at once.

Explosions of gunpowder, dynamite, etc., may cause loss of one or both eyes or may cause the skin and conjunctiva (the membrane which covers the eyeballs and lines the lids) to be peppered with grains of powder. The grains of powder in the skin can often be helped by applying peroxide of hydrogen immediately. In the eyeball, they are best removed by an eye surgeon; if there is a delay, it is well to wash the eyes with a solution of boric acid, a teaspoonful to a glass of warm water. Cold applications applied over the closed lids, wet gauze or a wet clean handkerchief also help prevent inflammation.

Iron and steel workers show the largest percentage of industrial accidents, most of which may be prevented by wearing spectacles or goggles. The isinglass goggles are worthless because they are difficult to see through. Men working at chipping castings, turning on lathes, and grinding tools should always be protected by glasses, and the best glasses are the shatter-proof ones, although broken spectacle lenses almost never injure the eyes. The frames help hold the broken glass, and nature has provided natural defenses in the projection of the eyebrows, nose, and cheeks, as well as by the eyelids which automatically close so fast that they offer a great protection. Goggles purchased should conform to specifications of the National Safety Code.

It is very common to have chips of steel, sometimes only a millimeter or two in diameter, shot into the eyes with sufficient

force to penetrate the eye, lodging inside the ball or even going through the globe into the orbit. Sometimes these particles go through the iris, causing tears, and through the lens, causing cataract, or even injuring the retinal and choroid coats, causing serious hemorrhages. Sometimes the wound of entrance is so minute that it can be seen only with a strong magnification. If there is the slightest question, an X-ray should be taken. With our present means of localization, the exact position of the steel can be seen, and the particle can be extracted by means of the electro-magnet. If it is left in the eye, the steel rusts, causing a change of color in the eye and frequently rapid inflammation and breaking down of the tissues of the eye.

Particles of copper and brass less commonly are forced into the eyeballs because they are softer and not brittle and do not chip off so easily. Striking a cold chisel with a hammer has caused the greatest number of accidents that I have seen, pieces of the chisel or hammer breaking off and flying into the eye. Cheap hammers are usually responsible. The best hammers, thoroughly hardened, are the only ones safe to use. These particles go into the eye very hot and are not so likely to cause infection as are pieces of stone, mortar, or brick, which go in comparatively cold and carry infection for that reason.

We get many chemical injuries to the eye. Perhaps the commonest are alkali burns from slacking lime and plaster. Alkali burns are frequently worse than acid burns because the alkali continues to burn, whereas acid is soon diluted and neutralized by the tears. The first aid treatment of alkali burns such as those caused by ammonia, lye, lime, plaster, etc., is to put the victim on his back, open the eyelids, and pour warm water in large amounts into the eyes until expert help can be gotten. If you have vinegar handy, a few drops may be added to the water to help neutralize the acid.

Bottlers of aerated beverages are sometimes injured by broken glass, as are bartenders. X-ray pictures do not show glass unless it is lead glass, or rarely flint glass when the rays of light just catch the edge of the glass.

In any of these industrial accidents, frequently the object causing the injury has less to do with the destruction of sight than the

germs which may be in the eyes, or which are introduced by dirty implements used in its removal or by dirty dressings applied to the eyes. Small packages of sterilized gauze, large enough for one dressing, sealed in envelopes and not opened until they are placed on the eye, and a tube of sterile vaseline to be used but once, should be in every shop where eye accidents are likely to occur. These pads can be fastened in place with strips of adhesive plaster, or can be covered with a black fabric eye pad. Never, under any circumstances, use a celluloid eye shield, for because of its inflammable nature, it may cause serious burns through ignition by a carelessly lighted cigarette.

Importance of Medical Eye Examination

Before taking up the medico-legal aspect I would like to amplify the suggestion previously made of the importance of a complete eye examination by an eye surgeon, before employing any worker, from the point of view of efficiency, accident prevention, and consideration of disability other than accident, as well as the avoidance of demands on the pension fund of the organization. The reasons for this examination are: First, to prove that he is physically competent to do the work; second, that any pathological conditions which may be progressive, or which might be aggravated by minor injury or strain are not present, or if they are present, that they are a matter of record for consideration if their presence becomes a matter of importance in connection with a claim for compensation; and third, that the employee be given proper advice concerning any determinable tendency or inherent weakness so that he may take proper care of himself to avoid disability.

A complete examination of the eyes may easily be the most important part of a physical examination because it determines the employee's ability to see, which is likely to be a determining factor in his efficiency. Then again, such an examination may reveal conditions of the general health which are overlooked in an ordinary physical examination. For instance, unsuspected kidney disease, diabetes, brain tumor, syphilis, and tuberculosis are often picked up by the ophthalmologist without the aid of a general physical examination.

I would stress also the importance of regular and systematic eye examinations, for the reason that the eyes change with advancing years, and because a man has good eyes at the time of the original examination is no criterion of what he may have in the succeeding years.

Medico-legal Aspects of Eye Accidents in Industry

Under our present compensation laws when an employee receives any kind of injury, there are certain important considerations which may determine the cost to the employer. First, the kind of first aid treatment he receives immediately, and the competence of the treatment he receives subsequently; second, the extent of the damage done by the injury, which may easily be mitigated or even increased by the kind of treatment he has received; third, the aggravation of an existing pathological condition which may have been progressive in itself, and which might have caused blindness even without the injury. One constantly meets compensation cases where partial or total loss of vision is claimed, when, without a doubt, a pre-existing disease or scar from a previous injury has been taken advantage of to magnify the claims for compensation.

After the ophthalmological examination and the protection of the eyes by proper shatter-proof goggles, guards for machinery, etc., the next important consideration is the seeing conditions under which the employee works. The efficiency of a worker depends on the kind of illumination he receives. Accumulations of dirt on light bulbs and fixtures reduce the illumination and a little soap and water will remedy this trouble. So also dirty, drab surroundings absorb a proportion of light. Glare from unshielded drop cord bulbs within the range of vision, and from polished desks and machines, is easily taken care of, and its elimination adds to the workers' efficiency and decreases the accident hazard.

The medico-legal aspect of eye injuries is an absorbing and important subject which I shall have time only to touch upon but is one which comes very close to the hearts and pocketbooks of both employer and employee.

First, let us take up wounds of the eye, eyebrow, eyelids, etc.

They, like all other wounds, may be contused, incised, punctured, or lacerated.

Contused wounds of the external coverings of the eye are usually manifested by what is known as a black eye, ordinarily of slight importance, but occasionally sufficiently severe to injure the periosteum or membrane which covers the bone, where abscesses may ensue causing destruction of the eye. A contusion of the eye itself may cause rupture of the globe, cataract, dislocation of the lens, or detachment of the retina. It is important, therefore, to have a thorough ophthalmological examination of such cases immediately.

Incised wounds of the eyelids, brow, etc., are clean-cut and, in the absence of infection, heal readily without much scarring. However, if the edge of the lid is split, the tissues retract leaving a V-shaped deformity, unless skillfully sutured. The fibers of the levator muscle—that muscle which elevates the upper lid—may be severed, causing permanent drooping of the lid. If the two ends of the muscle are found and sutured, no such deformity takes place.

Incised wounds of the eyeball may affect only the membrane covering the eye in which case little damage is done; or they may injure the cornea or deeper structures which is a serious matter.

Punctured wounds are inflicted by slender objects: lead pencils, pens, sharp slender tools, etc. These wounds present two difficulties: First, the danger of breaking off a point of the instrument and its retention in the wound; second, the danger of infection—for we can safely consider that such wounds have carried into them ordinary germs of sepsis, and sometimes the germs of tetanus. The germs of tetanus develop in such wounds because of the exclusion of air. These wounds should be thoroughly cleaned down to the bottom, and injections of anti-tetanus vaccine given. If such a wound occurs in the globe itself, the patient should be hospitalized under expert care immediately.

Wounds of the cornea may be abrasions involving only the superficial layer, or they may be deep. The danger of even the superficial ones is that of infection and corneal ulcers.

Foreign bodies in the globe should receive intelligent first aid, then X-ray localization; and if magnetic, immediate extraction by

the electro-magnet, for the retention of a foreign body in the eye is a potential source of danger so long as it remains there.

Having done everything possible for the injured man and having perhaps saved his sight, have we gotten over all our troubles? By no means, for while I have the greatest admiration for the legal profession, there are black sheep in it, as in every other profession or business, and an accident case is like manna from heaven to some of them. They get in touch with the injured man and persuade him that his injuries should receive more compensation than he is getting, and if he happens to be the type of man who will yield to their persuasions, the employer faces litigation or increased compensation claims. This is done in three ways: First, by simulation or feigning of injury that had no existence in fact; second, by attributing to injury an actually existing disease or injury that had occurred previously, leaving some damage; third, by trying to exaggerate the amount of injury that did exist.

For instance, blindness of both eyes may be alleged. This is hard to get away with. A simple test is to close the eyes, extend one of the claimant's arms asking him to touch the tips of the fingers with the tips of the fingers of the other hand. If he is faking, he will not do this, but we know that the really blind have no trouble doing it. The eye specialist has other tests which he can make.

Blindness in one eye is easier to get away with. A simple test is to give him a book, or better, a page of numbers, place a pen or pencil vertically in front of the nose a few inches from the eyes. If he reads all the letters or numbers, he must be seeing with the allegedly blind eye because the pencil or pen shuts out some of the letters or numbers from each eye but allows the other eye to see them. There are numerous other tests.

A man may receive a blow from a fist cutting his eyebrow and try to attribute this to an injury in the shop. Such cuts are usually caused by the underlying bone, and because of that are longer underneath than on the surface. They are likely to have discolored edges, and the tissues are more or less ragged. A wound caused by a tool or instrument is longer on its outer surface than beneath and has sharply marked edges which are not so likely to be discolored.

There is a condition known as coloboma of the iris, showing a keyhole shaped pupil usually in the lower part of the iris, which is congenital and which is sometimes accompanied by blindness. Such condition has sometimes been falsely attributed to injury.

A condition known as pterygium, where the conjunctiva overgrows the cornea, is common in men who lead an outdoor life, sailors, truck drivers, etc. A similar condition sometimes occurs from injury, and occasionally a man with a natural pterygium will try to claim that it resulted from injury. A probe can be passed under a natural pterygium but not under a traumatic one.

A senile cataract or a diabetic one is sometimes palmed off as cataract resulting from injury.

I have recited just a few conditions that may arise in these compensation cases—though the list is limited only by the ingenuity of the claimant and his lawyer—in order to impress upon you the necessity of knowing, and having on record, the exact condition of the worker's eyes from the day of his employment, through the years, until his service is terminated. Such knowledge will save much money and many a headache.

Vocational Opportunities for Sight-Saving Class Students*

Charles E. O'Toole

THE author emphasizes the importance of considering the adaptability of the partially sighted to all occupations in relation to the various degrees of sight disability

IT IS the accepted philosophy of American education that every child should be given an opportunity for development according to his abilities. My work in education is in the field of guidance. Through guidance we help pupils discover their abilities and we assist them to development in line therewith. The factors in the guidance process are knowledge of the pupil's abilities, interests, ambitions and limitations, knowledge of the requirements and conditions in occupations, and true reasoning on the relation of these two types of knowledge.

The guidance program for the partially sighted pupils in our New York City schools is initiated through sight conservation classes. The teachers of these classes are concerned not only with the preparation of these pupils in the light of their abilities and limitations but with developing understanding of their eye conditions and the best eye habits and care essential to the correction and improvement of their sight. These pupils are motivated to choose and prepare for occupations through classes in occupational information and try-out courses in vocational subjects. They, also, are led to understand the abilities required for various kinds of work and how to relate these requirements to their own abilities and limitations, thereby definitely participating in the orientation

* Presented at the Institute on Conservation of Vision, Brooklyn, N. Y., April 17, 1936; arranged by the Bureau of Prevention of Blindness of the Division of the Blind, New York State Department of Social Welfare; and sponsored by the Eyesight Conservation Committee of the Brooklyn Health Council; Medical Society, County of Kings and Academy of Medicine; and the Brooklyn Ophthalmological Society.

and guidance process. They are not only taught to choose wisely the type of preparation for their future, but they are taught methods of self-guidance that will serve them well after they have passed beyond the school.

The basic principle of guidance is the recognition of individual differences. Since occupational skills are acquired and developed, it will be realized that many persons possessing the same degree of interest, ambition and even ability may differ in their acquisition of skill for the same kind of work. Ability and interest may open the door to employment, but success will depend equally upon the worker's development of skill in the work. There are certain basic skills; manual, mental and social, being the more generally recognized. The special consideration that enters in the case of the sight conservation pupil is his limitation to develop skill, based upon the degree of sight disability in each case. I contend, therefore, that we should not think in the terms of "what are the vocations for sight conservation pupils?" but, rather, in the terms of "how can sight conservation pupils adjust themselves to the vocations in which they are interested?"

Although I do not believe that we should be guided by so-called listed occupations for sight conservation pupils, I did consult a few such lists that were brought to my attention. I do not find it possible to learn from such lists the information that I seek regarding occupations for the partially sighted. In fact, I should not consider the vocational adjustment of the partially sighted on the basis of such a list. I shall read some of the occupations which I found listed: story teller in children's library, entertainer, teacher of dancing, teacher of elocution, interpreter in court, mother's helper, assistant in babies' nursery, ward assistant in hospital, practical nurse, manager of dog hospital, hairdresser, furniture polisher, housekeeper, waitress, laundress, cook, baker, kitchen maid, janitor, bookbinder, small store merchant, telegraph operator, wireless operator, automobile mechanic, gasoline service-station worker, garage worker, doorman, hat checker, elevator starter, sales clerk, collector, porter, bellboy, factory worker.

Since most of these are types of jobs held by adults it is quite obvious that they were listed from reports on persons who had secured employment. There is no reference in any of the lists I

have seen to necessary occupational requirements and preparation. Rather than think in the terms of "occupations suitable for the partially sighted," I prefer to think that an occupation should be considered non-suitable for the partially sighted only after it has been determined so from all the factors involved in occupational analysis as related to each degree of sight disability.

I have been engaged in placement work for the past fifteen years. It has long been the concept that placement of the handicapped should be conducted apart from the placement of normal persons. I find that there are handicaps more serious than the physical, such as the lack of proper attitude toward work and the personality handicap. Yet persons with such handicaps have not been singled out apart from others. In my opinion, it is this setting apart of the handicapped, intended, I know, to provide the best service, that actually militates against the best results in the case of the partially and less severely handicapped. Only a week ago I discovered an opening for a girl worker in a local concern. I have been interested in the placement of a girl who graduated with the highest honors from one of our high schools. She had been unplaced since graduation over two years ago. I told the employer about this girl's ability and accomplishments, also about her very pleasing personality. He said, "If she is all that you say, she is hired. Send her over in the morning." Promptly, at nine-thirty, the following day, when he expected to find me at my office, he telephoned me. "You didn't tell me this girl is lame," he said. "Of course, I didn't, because I do not see how her lameness will affect her work, and, after all, what are you hiring legs or brains?" was my reply. "I guess you are right, I'll hire her," he said. And that's my argument, my friends. Ability to do the work, all limitations considered, should be the basis on which placement should be made. During my experience, I have found many employers who willingly employed partially sighted persons but their sympathetic willingness was accompanied by their recognition of the ability of these persons to function as worthwhile workers at work for which they were capable. In fact, in the past, many large and small concerns preferred handicapped persons for certain kinds of work, particularly work of a repetitive nature, claiming that these persons were not only capable but were more attentive to their work.

Although the sight conservation pupil is entitled to every opportunity to prepare for the vocation of his choice, he cannot expect greater opportunities for absorption by industry than the average pupil. It has been stated that eighty per cent of the jobs in industry today do not require more than three weeks' training. In the light of this statement, the vast majority of these pupils, regardless of their vocational choice and preparation, may have to enter these jobs. In fact, if they were absorbed in proportion to the normal group, we should not be so concerned. In the interests of guidance, I feel that we should emphasize the importance of developing adaptability by these pupils to increase their opportunities for employment in this changing industrial world. The development of basic skills will promote this adaptability. For example, the pupil who learns how to operate a particular machine is not training for adaptability to the extent that a pupil does who trains for industry through a full apprenticeship in a machine shop.

True, the number of employment opportunities in general has decreased since 1929, but has the number of employment opportunities for the partially sighted decreased in proportion? What will be the absorption ratio of these persons in returning prosperity? How will changing occupational trends affect this group? These are but a few of the questions that should be answered before we can predict the vocational opportunities for our sight conservation pupils of today. Furthermore, without this knowledge of opportunities and trends, how can we guide our pupils wisely in their vocational choice and preparation? Don't for one moment think that our children are not giving some thought to this question. The fact that their fathers and older brothers and sisters, who may be educated and trained and who have no vision defects, have been unemployed for long periods of time is having its effect upon these pupils. Many of them have developed attitudes of discouragement that must be corrected before they will participate in a constructive guidance program.

Permit me to suggest three things that should be done in the interest of our sight conservation pupils. First, we should encourage these pupils to prepare for the new order in which they are living and which will offer them opportunities only in proportion to their development of adaptability; second, we should edu-

cate employers towards a consciousness of the ability of the partially sighted person as a worker and away from the mere expression of sympathy for such workers; and third, we should make a comprehensive study that will show the adaptability of the partially sighted to all occupations in relation to the various degrees of sight disability. This study not only will serve well in both guidance and education but in educating employers in our concept of the abilities of the partially sighted group as workers. If this is not done, we shall continue to prepare our pupils only to have them find that they may not be wanted when they are ready to enter the working world.

If you had expected that I would unfold to you a special field of vocational opportunities for these pupils in whom we are all so much interested, I regret to have disappointed you. All that I can offer you are the suggestions and I urge the agencies that are concerned with the vocational preparation and placement of these pupils to explore our vast continent of vocational opportunities. Perhaps a better understanding will be had and new placement concepts will grow out of such exploration, and we shall find it possible to render a better vocational and educational guidance service to our sight conservation pupils.

In conclusion, may I summarize the needs which should be recognized:

1. Adequate information as to the requirements of each occupation as related to the various degrees of sight disability.
2. Adequate information as to training requirements and training facilities for each occupation.
3. Adequate information as to occupational trends as they affect this group.
4. Adequate information as to facilities for placement of this group.
5. The promotion of employer co-operation in the training and placement of this group.
6. The promotion of local and state-wide clearance of all such information.

The accomplishment of this program of information and co-operation should make it possible for us to encourage these pupils to greater efforts with more assured success. Meanwhile, we shall attempt to train them in the development of adaptability so that they may enrich their possibilities for placement when they have passed beyond our schools.

Goggles*

Ralph W. Walder

A PLEA for the wider use of goggles in preventing accidents to the eyes in industry

IN almost every industrial center you can see a man going down the street with a cane. He is young and he looks healthy and strong, but he is tapping his way along, and when he comes to an intersection he has to wait until some passerby helps him across.

He is not using his cane to support a sprained ankle; he is blind—perhaps the victim of an industrial accident. His eyes can no longer thrill to the sunshine and the blue sky of a spring morning; he can no longer take part in his favorite pastime, whether it be baseball, fishing or hunting; he can no longer play cards at his club; nor can he watch his children run out to meet him when he comes home from work at night—in the first place he can't see them, and in the second place he probably has no job to come home from.

The eye is the most delicate external organ. It is a mass of nerves and muscles which transmit to our brain light and images; and while it is as well guarded by nature as it can be, nevertheless its position in the head is such that it is prone to mechanical injury.

Artificial eyes are made which fit well and are comparatively comfortable and comparatively inexpensive; it is hard for a stranger to distinguish an artificial from a natural eye. Artificial eyes will do, in fact, everything but see, and manufacturers will probably never be able to produce an artificial eye which will see. It is, therefore, most important to protect the workers' eyes, and this is accomplished by one or more of the following:

1. Proper guarding of machinery.
2. Proper guarding of the eyes.
3. Foresight in preventing eye injuries.

*Presented at the Institute on Conservation of Vision, Brooklyn, N. Y., April 16, 1936; arranged by the Bureau of Prevention of Blindness of the Division of the Blind, New York State Department of Social Welfare; and sponsored by the Eyesight Conservation Committee of the Brooklyn Health Council; Medical Society, County of Kings and Academy of Medicine; and the Brooklyn Ophthalmological Society.

There are several types of hazards against which protection is desirable and necessary. Perhaps the most common hazard is that incurred in chipping rust, scale or paint from old surfaces, breaking concrete and handling brick and old masonry. Another hazard which may not seem quite so dangerous, but which in fact is responsible for a large number of eye irritations, is ever present among those who work in dusty conditions as in foundries, in certain sand-blasting operations, and in handling cement and sulphur.

In machine shop work we have the hazards of direct blows resulting from flying pieces of steel and other machine parts, and the chances of any such flying metal entering the eye from the side are rather slight. Men are sometimes called upon to work in comparatively light concentrations of irritating gases, such as a light concentration of sulphur dioxide around refinery equipment or a faint trace of hydrogen sulphide as is often found on or near an oil derrick in a sour crude field. While complete respiratory protection is probably advisable in situations where such fumes occur, it is not always practical to provide or use such protection.

From this type of work it is only a slight jump to the many establishments which handle acids and other liquids either in the course of manufacture or in their employment in some other process —liquids which may splash and burn and which can do very sudden and serious damage to the eye.

In addition to the various sources of mechanical damage, we must give full and careful consideration to the possibilities of eye burns resulting from the many welding and cutting operations which now form such an important part of industry. The use of acetylene and electric welding and cutting equipment is becoming more and more prevalent. Unfortunately, a large number of people who are using equipment of this type are laboring under the impression that any colored glass which cuts down the glare and makes working conditions immediately comfortable provides a safe and adequate protection. This, of course, is far from the truth, as only certain types of glass are capable of absorbing the ultraviolet and infra-red rays which are not visible to the human eye.

There are available a number of different types of goggles, each designed to provide usable and practical protection for each of the types of hazards which are indicated. The one which comes first

to mind is the so-called chippers' goggles, and in modern form this is usually constructed of two plastic or composition eye cups made in rights and lefts, and anatomically shaped to fit the face. These cups or frames are well ventilated at the sides with either perforated metal or screen ventilators, and are held in place with elastic, gum rubber, or non-rubber headstraps. The lenses themselves are of shatter-proof glass, free from flaws or defects which would strain the eye. It is interesting to note that the manufacturers of standard goggles are able consistently to furnish lenses which have less optical error in them than may be expected to exist in even the most carefully made prescription lenses. Most lenses derive their shatter-proof qualities from a process of annealing which breaks up the natural strains in the glass and may be likened to the case hardening of metal. The natural elasticity of the glass is preserved in the inner part, but the outer portions are rendered hard to withstand the impact of flying objects, and the result is such that it will not fly into a great many pieces even if it is broken. Some glass used in modern goggles is flat or plate glass, whereas a number of manufacturers are now standardizing on optical glass with the slight curvature of 1.25 diopter. There are also on the market 6.00 diopter lenses which have a noticeable arch, and naturally derive extra strength from the arched construction.

The materials used in these goggles should be readily sterilized by boiling in water or by chemicals, and should be non-conductors of heat and electricity. The trend in chippers' goggles, as well as in many other goggles, is now toward the 50 mm. instead of the 45 mm. lenses which were used up until five years ago. In cases where men wear corrective glasses they have to be protected with chippers' goggles as well; for this purpose there are available several models of chippers' goggles with enlarged cups to accommodate the corrective glasses. What is basically a chippers' goggle can be used in a number of dusty conditions when the ventilators have been protected by suitable baffles on the inside assembly. The purpose of these baffles is to prevent dust from entering the cups, and, although the baffles cut down the ventilation to a slight degree, the additional protection which they give around particles of concrete, sulphur, emery, etc., is worth the comparatively slight discomfort due to the extra fogging of the lenses.

In machine-shop work, where the hazard is one of a direct blow, it is usually considered good practice to use a spectacle form of goggle rather than the cup type. The spectacle form of goggle is usually made of metal and glass throughout, although there may be a cushion on the nose bridge. The spectacle form provides ample protection against a direct blow while allowing full ventilation at the sides. These goggles are sometimes furnished with metal side screens, but it is difficult to obtain a metal side screen which is sturdy and which will fit the face comfortably. If the conditions are such that a spectacle with a side screen is considered at all, it is usually found to be a better practice to use the regular cup type of chippers' goggles. Shipyard workers and others employed in confined spaces where the ventilation is poor are usually provided with the spectacle type goggle, possibly on the theory that they would not wear the cup goggle, and 75 per cent of eye protection used all the time is better than 100 per cent used only when the boss is in sight.

The use of laminated lenses is to be discouraged because, although laminated lenses provide adequate protection against flying objects, they naturally tend to discolor in the course of time; and the resulting eyestrain may bring about a condition of discomfort which will result in the refusal of the workman to wear the protective devices. This discoloration is generally due to air and moisture getting between the sheets of glass and may be compared to the appearance of the early type of shatterproof glass automobile windshields after they were in service over a period of time.

For use in gassy conditions, we have the rubber gas-tight goggle which may or may not be furnished with shatterproof lenses. A goggle which is gas-tight is obviously air-tight, and the great difficulty with the older type of gas-tight goggle was that the lenses would fog up very rapidly. However, this feature has been corrected by the development of the "Nod and Shake" goggle, which has water wells in the bottom of the cups. A small amount, less than a teaspoon, of water is put in the water wells before the goggles are put on, and as the lenses fog up they can be readily cleared by the wearer who shakes his head, thereby throwing some of the water from the water wells against the inside of the lenses. The effect of this water is to wash off the fog and cool the lenses.

In handling acids and some other chemicals the conditions may be such that a rubber goggle with properly hooded ventilators will give adequate protection to the eye and still allow suitable ventilation. Such goggles are available from most manufacturers.

In welding and in cutting operations it is important to consider the possible effects of the invisible rays as well as the visible light. At one time, almost any colored glass which cut down the glare was considered to afford sufficient protection, and old-time welders who have become accustomed to a certain shade of glass are very much disinclined to change to an improved color. However, it is interesting to note that it is very often these old-time welders insisting on the same shade of glass which they used when they started to weld, who come to industrial hospitals with red and inflamed eyes. I quote here from Federal Specifications for welders' goggles: "The dominant hue shall be yellowish green unless otherwise specified." Various standard shades for welders' goggles were worked out by the United States Bureau of Standards and are available from all regular sources, and a person who is purchasing welding goggles for the first time would do well to seek and accept the advice of an experienced manufacturer who should, of course, be informed of the type of welding or cutting on which the goggles are to be used. In arc welding using 250 amperes or more, and in carbon arc welding and cutting, it is almost essential to use a head shield or hand shield which protects not only the eyes but the skin of the face.

Wherever goggles should be used we are quite apt to find opposition on the part of the workmen. This opposition may be primarily psychological and appears in two well-known and marked forms: First, the men say the goggles are uncomfortable; and second, they say they interfere with vision by limiting the side vision and fogging.

In putting over a successful eye-protection program, we may as well admit in the beginning that goggles are unnatural and something of a hindrance to work, but experience has enabled manufacturers to build goggles which are infinitely more comfortable and safer than goggles used two years ago. As indicated before, goggles are now anatomically shaped and made in rights and lefts. One reason why the goggles may cut a man's cheek is that the headband is too tight and worn incorrectly. If elastic headstraps are renewed

frequently or if rubber or non-elastic headstraps are used, there is no need to adjust them too tight—in fact, they should be worn so that two fingers can be passed between the head and the headband. Goggles should be worn sufficiently loosely so that there is no cutting of the cheek.

Fogging may be corrected to a considerable degree by the use of one of several anti-fogging compounds or pencils on the market. In many cases fogging is due primarily to perspiration, and by the use of a handkerchief or similar cloth tied around the forehead, this difficulty can be eliminated to a considerable degree.

Under ordinary circumstances a man uses a field of vision of about 150°. In most all these cup goggles 115° of vision is possible, and it is the general opinion that a man does not use a whole lot more than 115° of vision normally. When you want to see anything which is not directly in front of your eyes, you do not hold your head stationary and move your eyeballs, but you are more likely to move your whole head. Now you can do the same thing wearing a pair of cup goggles and get direct vision on your work. This fact has been demonstrated a large number of times in conversations with workmen, and usually the workman will agree that the cup type of goggle is not interfering with his practical vision.

In buying eye protection it is very much worth while to buy from reputable dealers and furnish goggles which meet federal specifications wherever there are such specifications applicable. By so doing the workman is assured of the best and safest protection, with slight chance that the lens will break easily or distort his vision; and the purchaser is assured of obtaining his money's worth, plus adequate service to take care of instructing his personnel in the use of goggles, and to take care of their repair as it may be necessary. Manufacturers should co-operate with industry in working out plans by which the use of goggles will be popularized among the personnel.

In conclusion, don't you think the saving of one, two or three eye injuries in a plant in the course of a year is certainly worth the earnest and careful attention of the management, both from the point of view of economical operation and freedom from compensation costs? It is obvious that to the employee figures will never represent the value of his sight to him or the distress and mental suffering to his loved ones!

Editorial

Eyes on Vacation

IS there anyone who does not have his eyes on vacation on a summer day? All roads seem to lead to the green fields and blossoming orchards. And the spectacle of open spaces and stretches of green does present the lure of rest to eyes, especially the eyes of city-bred people whose vistas usually extend no farther than the nearby skyscraper.

But summer, with its attractions of outdoor life, its increasing opportunities for sports, and its added hours of play, brings additional dangers to the eyes of old and young alike. In fact, frequently vacation days hold seasonal hazards for the eyes, such as high winds and bright, glaring sunlight. Children, enjoying their freedom from school, spend the greater part of the sunlit day out-of-doors, and, in the city streets particularly, their play is sometimes dangerous. There is the chance of being hit in the eye with a ball or with toys, or of infecting the eye through getting particles of dust or dirt in it.

Tennis, swimming and diving and other games and sports, present hazards to the eyes through accident. Occasionally we hear of cases of detachment of the retina caused by too violent exercise, and sometimes the black eye from a tennis ball may result in more serious damage to the eye.

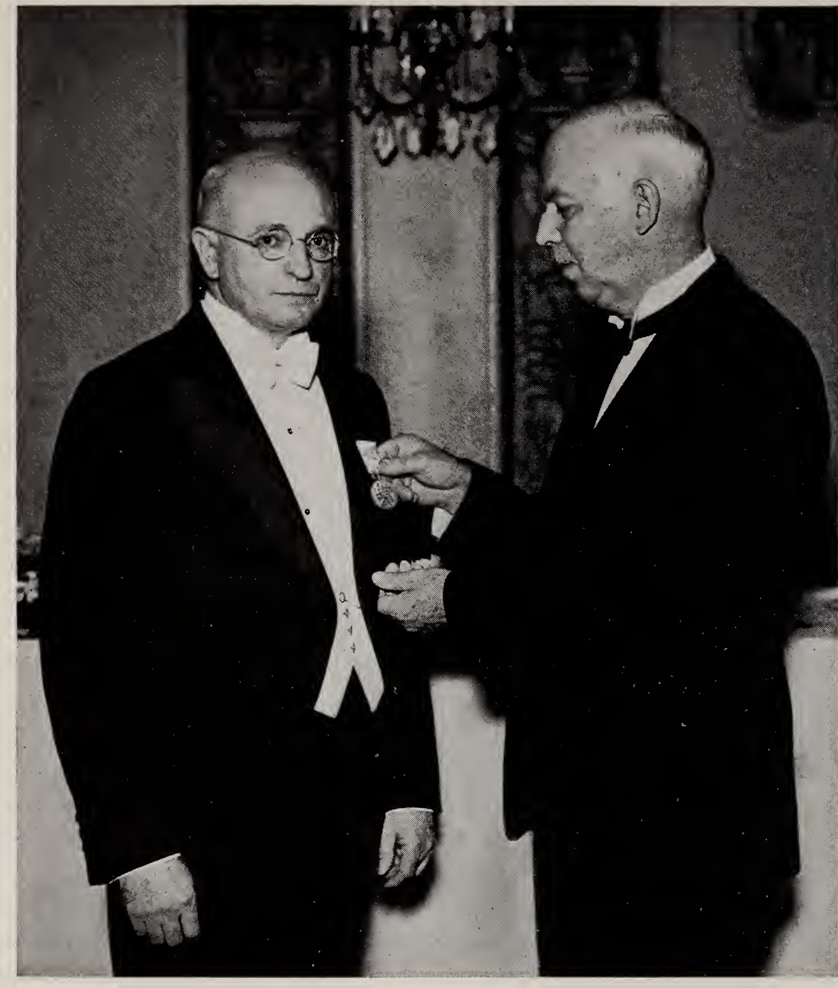
Then, too, the popularity of the automobile has made it a more frequent source of accident. Especially over week-ends, increased numbers of automobile accidents are reported in the newspapers. In the past, not a few automobile accidents have resulted in the loss or serious wounding of an eye, because of shattered glass. Fortunately, recent campaigns for safe and sane driving as well as for the use of shatterproof glass in automobiles lead us to hope that there will be fewer accidents.

The common housefly is a source of infection and has been known to cause epidemics of eye trouble. In Egypt and some parts of the Orient, the fly is such a factor in the health of the countries

that during July, as the fly season advances, eye troubles increase by the thousands, so that an actual wave of eye disease occurs during July, subsides a little in August, and recurs in September, finally falling down as the later fly season wanes. Fortunately, the housefly has ceased to be a scourge in America, but still those sections which are most congested with people are inflicted with the most flies. It is necessary to observe the rules of cleanliness to keep flies from becoming a general health problem, and incidentally an eye hazard.

Perhaps the most serious eye hazard of all, during the summer months, is occasioned by the Nation's attempt to commemorate the most glorious of its holidays—the Fourth of July. Through force of custom this celebration has taken the form of shooting off fireworks, and young and old have preoccupied themselves with this form of celebration, to the great detriment of a percentage of them. Last year thirty persons are known to have died, and at least 7,738 were injured by fireworks, matches and bonfires. Through a thorough study of 3,000 cases in which it was possible to secure firsthand information, it was found that 2,500 required hospital treatment. The total number of eye injuries among the 3,000 cases was 539, and 57 persons lost the sight of one or both eyes. In the past thirty years alone, more Americans were killed in fireworks accidents than were killed in gaining our independence during the Revolutionary War. In the same length of time, there were sixteen times as many injured by fireworks than were injured during the Revolutionary War.

It is not the wish of the editors of the Review to dampen the eager spirit of vacationists or to deprive the patriot of his right to express his zeal in celebrating Independence Day. All we wish to point out is that a lost eye cannot be replaced. It may make no difference so far as sight is concerned how it was lost, but it must make a vast difference to the victims to realize that they might still have their sight but for carelessness, neglect, or public apathy.



Lewis H. Carris, managing director of the National Society for the Prevention of Blindness, presenting the Leslie Dana Gold Medal to Dr. John M. Wheeler, director of the Eye Institute of the Columbia-Presbyterian Medical Center in New York, for his "outstanding achievements in prevention of blindness and the conservation of vision." The presentation was made at a dinner in St. Louis in honor of Dr. Wheeler.

Note and Comment

Society's Proceedings Available.—The *Proceedings* of the Annual Conference of the National Society for the Prevention of Blindness will be available on July 1. The 164-paged volume consists of sections on the following topics: Medical Social Service in Preventing Blindness; Prevention of Blindness Responsibilities of Official and Volunteer Agencies; The Problem of Fireworks Accidents; Annual Meeting Section; and The Public Health Nurse in Preventing Blindness. The volume is to be sold at cost—$1.00 per copy. Subscribers to the SIGHT-SAVING REVIEW will receive a copy, free of charge, as part of their subscription. Separate sections will be available at a cost of from 15 to 25 cents, dependent upon the number of pages of each section. These bulletins are listed in "Current Publications on Sight Conservation," p. 159 of this issue of the REVIEW. Orders may be directed to the National Society for the Prevention of Blindness, 50 West 50th Street, New York, N. Y.

Avoid Pitfalls in Eye Testing, Warns School Physician.—School eye tests should be indicative of the child's eye condition, not diagnostic, says Dr. Richard W. Weiser, medical supervisor of Kenmore, New York, in a recent issue of the *School Physicians' Bulletin*. All children showing visual acuity of 20/50 or worse in either eye should be rechecked for three successive weeks, since often a cold or other temporary health impairment causes a lessening of visual acuity. Since school testing cannot take the place of a thorough examination by an ophthalmologist, and is useful only as a screening device, it is open to errors. Every effort should be made to present the facts accurately to the parents so that warnings of eye trouble from school health authorities will be regarded as well founded.

Eye Medical Social Work at National Conference.—A joint meeting of the National Society for the Prevention of Blindness and the Family Welfare Association of America was held during the 63rd annual meeting of the National Conference of Social

Work in Atlantic City, New Jersey. The program concerned itself with "Responsibility for Interpretation of Eye Problems in Family Case Work," and the question was discussed from the viewpoint of the family case worker and from the viewpoint of a medical social service worker in an eye clinic. The Consultation Center afforded opportunity for delegates to confer with authorities in all fields of health and welfare activities, and medical social eye workers were met by representatives of the Committee of Medical Social Eye Workers at the exhibit booth of the National Society for the Prevention of Blindness. These included Mrs. Eleanor B. Merrill, of the National Society for the Prevention of Blindness; Miss Eleanor L. Hearon, eye social worker at the Colorado General Hospital; Miss Ruth B. McCoy, of the Department of Prevention of Blindness of the New York State Division for the Blind; Mrs. Francis W. Little, of the Maryland Society for the Prevention of Blindness; Miss Evelyn Carpenter, of the Philadelphia Committee for the Prevention of Blindness, Pennsylvania Association for the Blind; and Miss Jeanne Wertheimer, medical social eye worker at the Presbyterian Hospital, New York.

Eye Care for Children Popularized in Canada.—The Canadian National Institute for the Blind and the Canadian Welfare Council continue the joint publication of popular material on eye care for children. Two pamphlets recently received are "The Cross-Eyed or Squinting Child," and "Ophthalmia Neonatorum"; both are addressed to parents, and are forceful in calling attention to the dangers of neglect. Parental responsibility for getting treatment for both ophthalmia neonatorum and squint is stressed.

Eye Symposium at Biennial Nursing Convention.—To emphasize the trend of united efforts for adequate eye care, a symposium has been planned on eye health during the session of the Biennial Nursing Convention in Los Angeles, June 22 to 27. "General Eye Information for Nursing Students" will be presented by Miss Maria Johnson, R.N., superintendent for nurses at the Latter Day Saints Hospital, Salt Lake City, Utah; "Problems in Eye Health Confronting Public Health Nurses," by Miss Mary Emma Smith, R.N., state supervising nurse, State Bureau of Public Health, State Department of Public Welfare, Santa Fé, New

Mexico; "Saving Eyes in Industry," by Miss Lillian Jones, R.N., Fiber Board and Products Company, Los Angeles; "Scientific Advance in the Field of Eye Health," by Dr. John P. Lordan, Los Angeles; and "Ophthalmological Care and Why," by Dr. George N. Hosford, San Francisco. The meeting will be called under the leadership of the National Society for the Prevention of Blindness.

Eye Film for England.—"Do You See?" is the title of a new talking film made to illustrate the work of the National Ophthalmic Treatment Board in Great Britain. History of spectacles, the present-day need of eye care, and the relation of the eyes to the rest of the body and to general health lead up to a description of the services of the National Eye Service Center.

Lighting for Health.—Issued by the National Safety Council as its health practices pamphlet No. 18, "Lighting for Health" outlines the relation between lighting and eyestrain, and lighting and visual defects. This workmanlike bulletin refers to industrial studies that have shown the advance in health and efficiency through improved illumination; simple diagrams of light sources and visual mechanism make it of value as a popular and comprehensive reference.

Summer Courses for Sight-Saving Class Teachers.—Five universities will offer, during the coming summer sessions, courses for the training of sight-saving class teachers. The work offered is not only specifically directed toward the preparation of teachers and supervisors of sight-saving classes, but is of interest to those interested in sight conservation work. In order of the opening of the sessions, the courses will be given at:

University of Cincinnati, Cincinnati, Ohio.—June 22–July 28, 1936. Registration on or before June 15.

Wayne University, Detroit, Michigan.—June 22–July 31, 1936.

University of California at Los Angeles, West Los Angeles, California.—June 27–August 7, 1936. Registration, June 27.

State Normal School, Oswego, New York.—June 29–August 7, 1936. Registration, June 29. Course given at Syracuse, New York.

Teachers College, Columbia University, New York.—July 7–August 14, 1936. Registration must be made in person, July 2, 3 or 6.

Staff members of the National Society will serve as special lecturers at these courses. Complete information may be secured from the National Society's headquarters at 50 West 50th Street, New York, or from the universities giving the courses.

Lions Clubs Devote Special Program for Sight Conservation.—Definite and direct action for helping persons with poor vision and in assisting in conservation of vision has been taken by Lions Clubs in towns and cities all over the United States and Canada. Providing glasses to persons unable to pay for them, transporting people in need of eye care to hospitals, raising money for eye operations when otherwise it might be impossible for the operation to be done, instigating school eye clinics and special examinations, supplying funds for glasses for children with defective vision and for treatment in cases of eye disease, and organization work for the prevention of blindness are usual items in the reports of community Lions Clubs. The spirit of service that shares both time and money with those less fortunate has been marked in these efforts to conserve eyesight.

Aid for Color-Blind Drivers.—It has been estimated that from four to six per cent of the male population is color blind. Devices have been suggested to aid the driver of a car who is color blind, but the suggestions have usually been aimed at changes in the traffic signal design; Thomas Ross, of the University of Washington, describes an infallible and simple expedient for the color-blind person. By fixing to the windshield of the car red and green filters, one above the other, and not interchangeable, the color-blind person may carry with him his guide in interpreting the changing traffic lights. Because red and green are complementary colors, the red signal will be visible only through the red filter, and the green signal through the green. Further identification of the filters might be by perforation of the filters in such a way as to identify them by the design of the perforation.

Prevention of Blindness at Annual Meeting of the American Medical Association.—Three papers on subjects of popular interest were presented at the opening session of the section on ophthalmology of the annual meeting of the American Medical Association in Kansas City this year. "Causes of Blindness in Penn-

sylvania from the Medical and Social Aspects" was presented by Dr. Alfred Cowan. "The True Importance of Aniseikonia," by Dr. Edward Jackson, and "Cataracts Following Dinitrophenol Treatment for Obesity," by Dr. Warren D. Horner, were other topics having sociological as well as medical implications.

Safety Glass Becomes Standard.—When is safety glass safe? What qualities in a so-called safety glass are demanded to meet the description of safety? The American Standards Association has brought together certain requirements for safety glass, to which all safety glass must conform to insure protection in case of accident. Studies have shown that, to be considered safe, glass must withstand the impact of a half-pound steel ball, dropped from a height of ten feet; it must be so resistant to shattering that under no conditions will it break into fragments greater than 0.15 of an ounce. The problem of discoloration is taken into account in developing standards: exposure to ultra-violet light, equivalent to two and a half years of normal sunlight, should not produce more than an imperceptible tinge, unnoticed until the glass is placed on a white background. Tests for separation, resulting in distortion of images seen through the glass, include immersion of the sample glass in a saturated solution of sodium nitrate. Glass that passes satisfactorily through these tests will henceforth bear a label stating that it has conformed to the standards set by the American Standards Association.

Goggles Save Sight.—An employee of a large electric supply plant, attempting to drain water from a hydrogen drier, experienced some difficulty in opening the petcock. On the third attempt to release it, pressure from leakage in the valve suddenly forced out the plug, and splashed caustic solution over the employee's face and arms. Fortunately, goggles saved his eyes from the blinding acid, and a nearby water line prevented the serious burns that might have been the result had prompt washing not been possible. Routine safety practices—the compulsory wearing of goggles—saved a compensation loss of $15 a week for the rest of that man's life. Saving of that man's sight, alone, may have paid a large part of the cost of a safety program. Says *Safety Engineering*, in commenting on the incident: "Foreseeing possible

injuries and then guarding against them with safety precautions, instead of waiting until the accident happens, and then establishing safety procedure, is obviously much the wiser method."

Science Finds That Cat Has Two Kinds of Sight.—It has been an accepted fact that man needs three things for vision: eyes through which to see; light for illumination; and a brain to interpret the image that is seen. Yet experiment with cats, from whom that section of the brain cortex that controls vision had been removed, showed that they still saw light and that a sudden movement near their eyes caused blinking and other muscular reaction. Dr. Karl U. Smith, of Brown University, who reported this experiment to the American Psychological Association, concludes: "Apparently there is a critical division of labor between the nervous mechanisms controlling the eye movements alone and those controlling the body and legs in response to objects seen. In the normal cat, these mechanisms work together in perfect harmony and co-operation. But cats lacking entirely the visual cortex of the brain keep a rudimentary capacity to avoid objects and threatening gestures."

Color Rightly Woman's Tool.—Although in lower orders of creatures, color is the distinguishing mark of the male, among humans the male seems to be lacking in color sense, both physiologically and psychologically; color-blindness, present among four per cent of males, has been noted in less than half of one per cent of women. Among those not color blind, moreover, men find greater difficulty in distinguishing shades and tones of color than women, accounted for, perhaps, because as a rule women have greater interest and greater need for the application of color in their homes and in personal adornment. Unlike musical pitch, color is difficult to carry in the mind accurately. Because it is theoretically possible to detect two million colors, differing in saturation, brightness and hue, the eye cannot carry the close differentiations.

Prevention of Blindness in English Handbook.—The Standing Committee on the Prevention of Blindness of the Union of Counties Associations for the Blind has released a most comprehensive

Report on the Prevention of Blindness. Historical survey shows that the first movement for the prevention of blindness had its birth in London, in 1879, and inspired Fuchs, then a young professor, to write his memorable essay on "The Causes and Prevention of Blindness." From this early beginning has evolved the present organization for the prevention of blindness, whose program on prevention of blindness is clearly set forth in this publication. A section on the physiology of vision is followed by other phases of the eye in health and disease; Ascertainment and Treatment of Eye Conditions stresses the social and educational aspects of the problem of impaired vision; Occupational Blindness covers the problem of eye injuries in industry, and Suggestions for the Future outlines new paths to hew through preventable blindness. The book is a valuable contribution to the established literature on eye conditions and the sociological implications of preventing blindness. The material is clearly presented, comprehensible to the uninitiate, and suggestive to the worker in conservation of vision.

National Society Notes.—Staff members of the National Society will serve as special lecturers during the summer session training courses for teachers and supervisors of sight-saving classes. Mr. Lewis H. Carris, managing director, will lecture at the University of Cincinnati, Wayne University, Detroit, Michigan, the State Normal School, Oswego, New York, and Columbia University; Mrs. Winifred Hathaway, associate director, will direct the course given at Columbia University; and Mrs. Francia Baird Crocker, R.N., associate for nursing activities, will serve as special lecturer at the University of California at Los Angeles.

Assisting groups and organizations in promoting sight conservation in localities and as part of their program, staff members have traveled to various sections of the country. Mr. Carris talked with the Ohio State Organization of Sight-Saving Class Supervisors and Teachers on "Sight Saving as a National Responsibility." At New Brunswick's Week for Health, held under the auspices of Rutgers University, Mr. Carris talked on sight conservation and the prevention of blindness. In Lincoln, Nebraska, he assisted in a survey undertaken by the State Bureau of Child

Welfare, and in Philadelphia, he addressed the Philadelphia County Medical Society's section on ophthalmology. The presentation of the Leslie Dana Gold Medal was made by Mr. Carris in St. Louis. Here also he talked at the annual convention of the Edison Electric Institute on "National Responsibility for Sight Conservation."

Study of eye health problems in teachers colleges and universities has taken Dr. Anette M. Phelan, staff associate in education, to Smith College, Rochester University, Albany State Teachers College, State Teachers College at St. Cloud, Minnesota, and Ball State Teachers College, Muncie, Indiana; in co-operation with the Association for Childhood Education, she conducted a study class on "The Exceptional Child" at Columbia University.

At the Institute on the Conservation of Vision, held under the auspices of the Bureau of Prevention of Blindness of the Division of the Blind, New York State Department of Social Welfare, and sponsored by the Eyesight Conservation Committee of the Brooklyn Health Council, the Medical Society of Kings and Academy of Medicine, and the Brooklyn Ophthalmological Society, Mrs. Hathaway talked on "What are the Educational Facilities for the Visually Handicapped?" and Mrs. Crocker discussed another of the papers. Mrs. Crocker has been meeting public health nurses and student nurses on a trip which has taken her to Detroit, Michigan; Columbus, Ohio; Minneapolis, Minnesota; Madison, Wisconsin; Ann Arbor, Michigan; and to the Biennial Nursing Convention in Los Angeles, California. She represents the Society at that convention, with an exhibit, featuring a continuous showing of the Society's film, "Preventing Blindness and Saving Sight," as well as publications. The booth will be headquarters for visitors interested in the conservation of vision.

Mrs. Eleanor Brown Merrill, who represented the Society at the National Conference of Social Work and at the joint meeting of the National Society and the Family Welfare Association of America, talked before the National Council on the Physically Handicapped on "Occupational Adjustment of the Visually Handicapped," during its meeting at the Social Work Conference. Representing the Society also was Mr. David Resnick, director of publicity, who participated in the meetings concerned with social work publicity.

Radio programs have recently featured sight conservation: Mrs. Hathaway spoke over the air on "How's Your Eyesight"; a talk on "Conservation of Vision in School Children," was given by Mrs. Crocker; Miss Regina E. Schneider, secretary of the Society, talked on "How Sight Is Saved."

Current Articles of Interest

Enemies of Eyesight, J. M. Smith, *National Safety News*, January, 1936, published monthly by the National Safety Council, Chicago, Ill. Inadequate intensities of illumination, plus glare, place a serious burden on the eyes, says the writer, who points out the economic efficiency of good, planned illumination in industrial plants.

Trivial Eye Injuries, Sidney Walker, M.D., *Industrial Medicine*, January, 1936, published monthly by Industrial Medicine, Inc., Chicago, Ill. No eye injury is trivial, for the most unimportant accident may result in complete loss of vision unless proper care is taken. The author concludes: "It is very nearly an axiom that little credit is given to the industrial surgeon for the favorable outcome of an eye injury, and lots of grief if the outcome is not good. Therefore little is to be gained by unnecessarily exposing the injured man and yourself. For the protection of all concerned an early examination by a competent oculist should be had in many of the cases of so-called trivial injuries."

Hygienic Lighting Intensities, Miles A. Tinker, *Journal of Industrial Hygiene*, November, 1935, published monthly by the Williams and Wilkins Company, Baltimore, Md. "In general," summarizes the author, "it has been found that efficiency of performance is just as good at approximately 10 foot-candles as with brighter illuminations in such practical situations as letter sorting in post offices, doing number work and in reading. . . . There is no experimental evidence to support the suggestions that very bright lights are best for reading by normal eyes."

Squints and Squint Training, James H. Allen, M.D., *Public Health Nursing*, February, 1936, published monthly by the National Organization for Public Health Nursing, New York, N. Y. A physician describes for nurses the features of that group of squints which embraces the majority of cases and which offers good results from adequate early treatment. The stressing of this

knowledge to nurses, whose family contacts often make them the first to notice a case of squint in a young child, is of paramount importance.

The Case of Coryphee's Cousin. Chapter X of the *Doctor's Scotland Yard*, Robert A. Kilduffe, M.D., *Hygeia*, March, 1936, published monthly by the American Medical Association, Chicago, Ill. Fiction points to the hazards of dinitrophenol, a drug widely used for weight reduction, and to the chances of its use causing cataract formation in the eyes. In this story a dancer, seeking to reduce her weight, took a patent medicine containing dinitrophenol to hasten the process. The marked cloudiness of vision, which resulted from the drug, was incipient cataract. Reports have come of complete blindness, kidney and liver disturbances, and even death following the use of this drug.

Book Reviews

OPHTHALMIC NURSING. Maurice H. Whiting, O.B.E., M.B., F.R.C.S., London: J. and C. Churchill, Ltd., 1935, 184 p. ill.

Nurses will be interested to know about the second edition of this compact volume. It contains basic information for a better understanding of the function and care of the eyes with special emphasis on nursing procedures. Additional chapters on the anatomy and physiology of the eye written in the same concise and simple style would be valuable for nurses. After completing this book, one is not overwhelmed with the subject matter, but instead is eager to explore further in this special field. Its interest and usefulness could not be better attested. *Ophthalmic Nursing* is recommended to nurses wishing to secure a practical manual on this subject.

FRANCIA BAIRD CROCKER, R.N.

Briefer Comment

YEAR BOOK OF THE EYE, EAR, NOSE AND THROAT, 1935. E.V.L. Brown, M.D., Louis Bothman, M.D., George E. Shambaugh, M.D., Elmer Hagens, M.D., and George E. Shambaugh, Jr., M.D. Chicago: The Year Book Publishers, 1935, 638 p.

Drs. Brown and Bothman, whose contributions of abstracts of the year's contribution to progress in ophthalmology cover nearly 300 of the pages of this compact volume, have selected their material from a wide range of publications, largely foreign. The catholicity of the sources makes particularly valuable this reference work for those ophthalmologists and eye, ear, nose and throat specialists who do not have already access to comprehensive libraries of current publications.

THREE MONOGRAPHS ON COLOR. The Research Laboratories of the International Printing Ink Corporation. New York: The International Printing Ink Corporation and Subsidiary Companies, 1935. 3 monographs, 72 p. ill.

Selected as one of the fifty most attractively printed books of the year, this volume, consisting of three separate monographs,

is truly a treat to the eye for its beautiful typography and its colorful illustrations. Three topics are presented: "Color in Chemistry"; "Color in Light"; and "Color in Use."

Modern Ophthalmic Lenses and Optical Glass. Theo. E. Obrig, A.B. Philadelphia: The Chilton Company, 1935. 323 p. ill.

The author draws together a myriad of facts regarding the history of glass and its development as an optical aid; colored lenses; history of spectacles; contact lenses; telescopic spectacles; iseikonic lenses; bifocal lenses; and other varieties of glasses used to aid man to see. Of special interest to ophthalmologists, opticians and optometrists.

Proceedings of the National Conference of Social Work. Sixty-second annual session, Montreal, 1935. Chicago: University of Chicago Press, 1935. 748 p.

As the 1936 annual session of the National Conference of Social Work draws near, it is opportune to review the published *Proceedings* of 1935, for its evaluation of the situation which was "only yesterday." The legislative changes which 1935 have brought in social planning follow in many instances the thinking expressed in the *Proceedings*, under child care, old age security and unemployment insurance.

Mother and Baby Care in Pictures. Louise Zabriskie, R.N. Philadelphia: J. B. Lippincott Company, 1935. 196 p. ill.

This profusely illustrated volume takes its place as a thoroughly modern presentation of prenatal as well as postnatal care for mother and child. The language is simple, the pictures graphic. Of particular interest to the readers of the Sight-Saving Review are the sections dealing with the care of the newborn baby's eyes as well as those mentioning the care of the eyes during the baby's sunbath.

Current Publications on Sight Conservation

Note.—The National Society for the Prevention of Blindness presents the most recent additions to its stock of publications. Except for the more expensive ones, single copies are sent free upon request. Unless otherwise specified, they are reprinted from *The Sight-Saving Review*. New publications will be announced quarterly.

197. **Medical Social Service in Preventing Blindness.** 56 p. 25 cts. Proceedings of the Medical Social Service Session, the Annual Conference of the National Society for the Prevention of Blindness, December, 1935.

198. **The Problem of Fireworks Accidents.** 32 p. 15 cts. Proceedings of the Fireworks Accident Session, Annual Conference of the National Society for the Prevention Blindness, December, 1935.

199. **Influence of the Public Health Nurse in Preventing Blindness and Conserving Vision.** 40 p. 25 cts. Proceedings of the Public Health Nursing Session, Annual Conference of the National Society for the Prevention of Blindness, December, 1935.

200. **Prevention of Blindness Responsibilities of Official and Volunteer Agencies.** 26 p. 15 cts. Proceedings of the Official and Volunteer Agencies Session, Annual Conference of the National Society for the Prevention of Blindness, December, 1935.

201. **Glaucoma,** Philip A. Halper, M.D. 12 p. 10 cts. An ophthalmologist's description of the course of glaucoma, its ultimate end, and what can be done about it to save sight.

202. **Eye Conditions Prevalent in the Preschool Age,** Charles A. Hargitt, M.D. 8 p. 5 cts. Malnutrition and poor environment in early childhood foster certain diseases of the eye.

203. **Accidents in Traffic and Industry as Related to the Psychology of Vision,** T. W. Forbes, Ph.D. 16 p. 10 cts. The author discusses the factors involved in visual judgments of speed and distance, as well as in fatigue and drowsiness.

204. **Telescopic Spectacles,** Willis S. Knighton, M.D. 8 p. ill. 5 cts. A brief description of spectacles designed on the principle of the telescope and their use.

205. **The Eyes in Industry,** James H. Andrew, M.D. 12 p. 10 cts. An eye safety program in industry should provide not only protection for the eyes against injury, but should provide for adequate illumination and inspection for visual defects, to prevent accidents from visual inefficiency.

206. **Vocational Opportunities for Sight Conservation Pupils,** Charles E. O'Toole. 8 p. 5 cts. The author emphasizes the importance of considering the adapta-

bility of the partially sighted to all occupations in relation to the various degrees of sight disability.

207. Goggles, Ralph W. Walder. 8 p. 5 cts. A plea for the wider use of goggles in preventing accidents to the eyes in industry.

208. Prevention of Blindness. Proceedings of the 1935 Annual Conference of the National Society for the Prevention of Blindness, 1936. 164 p. $1.00. Consists of publications 197, 198, 199, and 200, plus the papers presented at the annual meeting, namely: "A Greeting," by Helen Keller; "Scientific Advance and Welfare Programs in Sight Saving," by Father Schwitalla; and "Looking Forward," by Winifred Hathaway.

D88. Saving Eyesight in Industry, Rose Henderson. Reprinted from *Hygeia*, February, 1936. 4 p. 5 cts. Goggles are a sound investment in any occupation, says this article, and goggles for eye protection on different types of jobs are described.

D89. Shall I Continue to Use the Snellen Chart? Francia Baird Crocker, R.N. Reprinted from *Public Health Nursing*, May, 1936. 2 p. An evaluation of the screening of visual defects through the Snellen chart, and definition of its limitations.

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The Sight-Saving Review

Volume VI Number 3

September, 1936

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Cosmetics Detrimental to Vision*

Walter I. Lillie, M.D.

THE increasing number of eye tragedies occurring as a result of the indiscriminate use of weight reducers, hair dyes and depilatories presents a problem to the doctor, the lawyer and the public, as well as to the beautician

INDIVIDUALS who use cosmetics are unwittingly subjecting themselves to visual dangers. We are all potential victims, because the present antiquated Food and Drug Act, passed in 1906, only requires the manufacturers of food and drugs to properly label their products but does not penalize the acts of adulteration and misbranding. False and fraudulent therapeutic claims must be proven before the product can be removed from the market. These two little words "and fraudulent" compel the Government to prove that the manufacturer knows the customer is being swindled. This has prevented any adequate control over quack or dangerous remedies. Extraneous advertising of these products through the newspapers, magazines and radio is without Federal control, and because of this we are constantly reminded of the wonderful benefits and cures that will be derived from their use.

Today the billion-dollar-a-year cosmetic industry is not subject to any Federal regulations unless the labels bear medicinal claims, which, of course, never occurs. There is no legal way to protect the public against dangerous cosmetics. Toilet preparations which are known to be harmful by the medical profession cannot be taken off the market regardless of any disfigurement or injury they may inflict. Although poisonous cosmetics that ravage their users by paralyzing, blinding or disfiguring them are the exception rather than the rule, the medical profession should be alert to the possibilities and probabilities of visual and bodily damage which may result from their use.

*Presented at the Eye Section of the Philadelphia County Medical Society, May 7, 1936.

The untoward visual effects may be temporary or permanent, depending upon the nature of the ingredient or the amount used, and the tolerance of the individual. The eyes are usually affected in one of two ways, either through direct contact with the preparation or indirectly through the absorption of the poisonous ingredient in the body.

Three groups of cosmetics have the potentiality of producing severe ocular damage, namely: (1) weight-reducing preparations, (2) hair dyes, and (3) depilatory ointments.

Weight Reducers

Preparations used for weight reduction usually contain either thyroid extract or dinitrophenol. The proprietary preparations "Marmola" and "Ringo Fruit," and others, contain thyroid extract which is usually combined with a high iodine preparation or a laxative. These are taken internally, and activate the body chiefly through stimulation of the thyroid gland. This gland may become so activated that ocular difficulties arise similar to those so frequently seen in patients suffering from a toxic or exophthalmic goitre. The eyes may become prominent and protrude between the eyelids. The exposure causes a congestion of the conjunctiva; this may progress to a conjunctivitis or an ulceration of the cornea. Corneal ulcers that do not respond readily to treatment may progress practically to complete destruction of the tissue, with an end-result of either dense corneal scars which disfigure the eye and greatly diminish vision, or a rupture of the eyeball Victims affected in a milder manner may have permanently protruding eyes, which are disfiguring and may develop after discontinuing the use of the drug. The following case is an example:

A female, aged 34 years, began using thyroid extract and Jad Salts in 1929 to reduce her weight, which had increased from 118 pounds to 173 pounds. This procedure was continued until January, 1935, with a reduction of weight to 120 pounds. At this time she became very nervous and developed a marked tremor of the hands and a rapid heart. The eyes became slightly more prominent, and her physician made a diagnosis of exophthalmic goitre. No improvement was obtained with Lugol's solution, and in February, 1935, the goitre was removed. The patient's general health improved following the operation, but her eyes rapidly became

more prominent, congested and painful. My first examination, in May, 1935, revealed an exophthalmos of 28 mm. of the right eye and 27 mm. of the left eye. The conjunctivae were congested, but the corneae were clear except for a slight roughening on the lower portion of each. Ocular rotations were limited in all directions. A Naffziger operation was advised and refused, so a medical régime of Lugol's solution was instituted elsewhere. Again, in August, 1935, my examination revealed the exophthalmos had increased 5 mm. in each eye, with inability of the upper lids to completely cover the corneae, even when forcefully closed. A Naffziger operation was advised and at this time consent was easily obtained. A bilateral removal of the orbital roof and superior wall of the optic canal was performed by Dr. Fay in August, 1935. Since then it has been necessary to do a bilateral blepharorrhaphy on three separate occasions, without much success. Her convalescence has been extremely slow, and at the present time the right cornea is entirely opaque while that in the left eye is clear in the upper half only. The exophthalmos has gradually receded to 27 mm. in the right eye and 26 mm. in the left eye. The upper lids now cover the corneae with ease, but the patient is still confined in the hospital.

Needless to say, it is an extremely sad story, and the end-result from a cosmetic and visual standpoint will be very poor. It is an exorbitant price for the loss of 53 pounds of weight.

Dinitrophenol has been known as a dye for a hundred years, and respected as a poison for more than thirty. During the War it was used in the manufacture of explosives and was investigated because the munition workers developed headaches, nausea, high fever and rapid loss of weight. When taken internally it also produces copious perspiration, warmth, hives and impairment of taste. It may damage the kidneys and heart. It is the deadliest of all coal-tar preparations and is toxic to everyone. Even when dinitrophenol is used in very small therapeutic doses it has a tendency gradually to produce opacities of the crystalline lens, and its continued use will produce cataracts. Interestingly enough, the opacities of the crystalline lens usually develop during the second course of treatment rather than the first. The victims will notice a gradual but progressive blurring of vision, which is not associated with any inflammation or discomfort in the eyes. These changes occur regardless of the age of the individual, but the younger group is more frequently affected. Glasses, as a rule, will not improve the

vision, and the surgical removal of the cataracts is necessary before good vision can be restored. The following case is an example:

A female, aged 45, began using dinitrophenol in March, 1934, because of excessive weight. She continued this treatment until September, 1934, stopping when she had lost 50 pounds. She again started its use in June, 1935, as the weight regained was annoying. This treatment was continued until September, 1935. During this second period of treatment the patient noticed "spots" before her eyes, and the vision gradually failed. My examination in February, 1936, revealed the vision in the right eye to be 6/30 while in the left eye there was only an ability to count fingers, which improved to 6/15 in the right eye and 6/30 in the left eye with glasses. The ophthalmoscopic and slit-lamp examination revealed numerous discrete white crystalline deposits in all portions of the lens of each eye, being more diffuse in the left eye. Undoubtedly, surgery will be necessary to restore useful vision.

Again, the price of 50 pounds loss in weight seems rather high, especially when a permanency of reduction is not guaranteed.

The numerous products on the market which contain dinitrophenol are variously named: "Nitromet," "Nitraphen," "Tabolin," "Redusols," "Formula 281," "Nox-Ben-01," "Aldinol," "Formula 17," "Slim," "Dinitrolac," "Dinitroso (Dinitrose)," "Dinitrenal," "Dinitrole," and others.

Hair Dyes

Cosmetics such as "Lash-Lure," "Inecto," "Inecto Rapid Notox," and similar products contain a synthetic anilin dye or an amino-compound which is used to dye the eyebrows and eyelashes. This amino-compound acts as a caustic when it comes in contact with the eyes. The victim notices severe smarting of the eyes, which soon become quite irritated, and the burning sensation spreads over the face and forehead. The lids become swollen and difficult to open, the pain is unbearable, and the usual household remedies give no relief. A watery and mucoid discharge from the eyes becomes diffuse, and the cornea usually ulcerates. These corneal ulcers may be deep enough to rupture the eyeball, or may only produce opaque white scars which decrease the vision markedly. If the eyeball ruptures, it has to be removed surgically because of infection. Even though the victim is hospitalized and

placed under expert care, the usual end-result in severe cases is a permanent diminution or complete loss of vision. The following case is a mild example:

A female, aged 39, following the use of "Lash-Lure" in a beauty shop, came immediately to the Temple University in March, 1935, because of severe lacrimation, congestion and pain in both eyes. The examination revealed a marked congestion of the palpebral and bulbar conjunctiva, with chemosis of the latter. The corneae were clear and did not stain with fluorescein. The pain was very severe, and could be relieved only with narcotics. After a ten-day stay in the hospital, the patient continued as a dispensary patient for about one month before the eyes returned to a normal condition. Her vision, fortunately, was unaffected.

Although this is a rather mild case, the patient was fortunate in that the corneae were not involved. Even though mild, she was incapacitated for about six weeks. This again demonstrates that the cost is too high for the cosmetic results obtained and the dangers to which one is unwittingly subjected.

Cosmetics such as "Kolor Bak" and similar products are used as hair dyes and contain a heavy metal, generally lead, mercury or silver. The absorption of the heavy metal may produce a retrobulbar neuritis, usually bilateral. The disturbance of vision is characterized by so gradual a diminution of central vision that the victim is unable to state definitely when the vision really became affected. At first, average-sized type can still be read, but the ability to read gradually fails. Vision at dawn or dusk or on cloudy days is much better than in the bright daylight. The visual symptoms may be accompanied by severe headache or by dull pain in the orbit. The pupils may dilate and respond poorly to stimulation by light. The central fields of vision are affected and the optic nerve may become pale or atrophic. The ability to read or see clearly in the distance greatly diminishes, and glasses will afford no improvement. The development of a permanent atrophy of the optic nerves will depend upon how much and how often the preparations are used. Once the optic nerve fibers are destroyed, no known helpful remedy is available, and dim vision or blindness is permanent. These ocular changes may or may not be associated with the general signs of the disease, namely: cramps,

paralysis of the extremities, loss of hair, blue gums, pigmentation of the skin, et cetera.

Depilatory Creams

An ancient method of removing hair from hides in the making of leather has been responsible for a group of cosmetics harmful to the skin. Lime, combined with the alkaline sulphides, was used centuries ago by the Orientals for removing unwanted human hair. Barium sulphide is sometimes substituted for quicklime in modern depilatories. None of them will remove hair permanently, and most of them irritate a sensitive skin. Years ago Dr. Sabourand, a French dermatologist, used a one per cent thallium acetate ointment for certain scalp diseases. He found that it caused so many accidents that he discontinued its use, and urged others to be cautious about it. However, Kora M. Lubin, in 1930, seizing upon the formula, manufactured a depilatory ointment containing from 3 to 7 per cent of thallium acetate. She named the product "Koremlu," using parts of her name to make the trade-name, and made it available to the public without a word of warning as to its dangers. As early as 1931 the medical profession began recognizing a clinical syndrome of pain and lameness progressing to paralysis of the lower limbs, associated with visual symptoms which were characteristic of retrobulbar neuritis, produced by the heavy metals, multiple sclerosis and other poisons. In most of the cases after the use of Koremlu was stopped the legs improved, but the visual damage remained permanently. Knowledge of the use of a depilatory cream is sometimes difficult to obtain, as the patient does not associate its use with her physical condition. The observation of the absence of facial hair on an otherwise hairy individual may give the first and only clue as to the etiology. I have previously reported two such cases as a co-author with Dr. Harry L. Parker, formerly of the Mayo Clinic, now Professor of Neurology, University of Dublin.

This brief and incomplete résumé of the untoward visual effects produced by the use of dangerous cosmetics gives you a bird's-eye view of the problem which confronts the medical profession and the Federal Government, and is why we wish to protect the public against the sale and use of these preparations.

A recently published book,* to which I am greatly indebted for material used in this paper, gives the inside story of the Government's fight to protect consumers against dangers to health, life and pocketbook. It is dedicated to a large number of women, representing many organizations, who have been holding the front-line trenches in the consumers' war for pure food, drugs and cosmetics. It contains the essential data, both pro and con, to thoroughly convince you that a new Federal food and drug act is absolutely necessary for this protection. It is a good book to have available as a reference book for doctors as well as patients.

The present administration has asked for a new food and drug act which will give consumers better protection than the present antiquated pure food law affords. The officials of the Department of Agriculture have drafted the Copeland Bill (erroneously called the Tugwell Bill), which is proposed in the interest of the public and the honest manufacturer. This act is to afford Federal control of the manufacturing, labeling, selling, advertising and shipping of prepared foods, drugs and cosmetics. This bill is actively supported by the American Medical Association, American Federation of Labor, The National Congress of Parents and Teachers, and eleven other national women's organizations. A powerful opposition lobby has been organized and is sponsored by The Proprietary Association of America and numerous allied groups. Their apparent aim is to keep the present inadequate Federal regulations unchanged, and so far their efforts have delayed constructive legislative action.

A new law must be passed to insure the public of a deserved protection. We as individuals and as members of medical organizations should put forth every effort to obtain adequate legislation against the promiscuous sale and use of poisonous foods, drugs and cosmetics.

* Lamb, Ruth deForest: *American Chamber of Horrors.* Farrar and Rinehart.

Sight Conservation as an Educational Problem*

Richard S. French, Ph.D.

MORE than ever, educators are using motion pictures, slides and other visual aids in carrying out their work. This trend alone necessitates an added interest in a school eye health program

Importance of Sight

Various estimates have been made as to the percentages of impressions coming from the outside world through the different channels of sense. There can be no doubt that sight holds first place, a fairly conservative estimate placing its share at eighty per cent and a bolder estimate at eighty-seven. Whatever the percentage, the fact holds that in the conscious and subconscious life of the person of normal vision there is an infinitude of impressions coming all through the hours of light, natural or artificial, by means of the eyes—direct impressions of light and shade and of color, secondary or inferred impressions of form, distance, movement, emotion, and so on; and, in sleep, the dreams are predominantly visual.

In schools the materials offered are more and more visual. The use of pictures, diagrams and graphs has grown enormously within the last twenty-five years. Illustrations in black and white and in color have improved in quality and in the effectiveness of their appeal. Visual devices—stereoscopes, lantern slides, moving pictures, models—are multiplied year by year and the world becomes more and more visually minded. To take the single example of spelling: this subject even thirty years ago was taught chiefly through spelling aloud; then it was found that the correlation of

* Presented at the meeting of the California Council for the Blind, April 4, 1936.

the oral and auditory faculties with the correct writing of the word was relatively slight, but that the seen word could be correlated with the muscular and visual act of writing, and the oral method dropped into practically complete discard. Spelling bees survive only in state fairs and similar traditional institutions.

So dominant a part does vision play in present-day human living that our psychology has become almost overwhelmingly visual. The old proverb holds truer than ever that "seeing is believing," while we are still cautioned to believe only half what we hear—and the fraction might well be put considerably lower.

In the esthetic life, only three arts fail to make their major appeal to sight, namely, music, poetry and oratory—yet all three are written or printed, and we fall ever deeper into the habit of reading silently both prose and verse—so that music alone remains the art of sound. Painting, sculpture, architecture, landscaping, the arts of home beautification and of floriculture, these not only appeal almost solely to the eyes, but their appeal is enlarged almost from day to day. Sight also means orientation both in our more restricted environments and in the larger world. Dr. Thos. Haines, of the Ohio Board of Administration, has, further, stressed the integrative action of sight—we can grasp wholes only through sight or through a very painstaking and painful mental integration; sound is disjunct for the most part, and also intensive and instantaneous, giving us at best in its nearest approach to wholeness, harmony. The other sense impressions are fragmentary and discontinuous in the extreme.

So important is sight, and the average person looks upon its loss as so complete a calamity, that not until nearly 1750 was it conceived possible to educate a blind person. It was only by the extension of the contact senses, especially touch, and the intensification of auditory instruction, together with the close correlation of auditory and tactual elements, that the education of the totally blind became at all possible. And he would be very bold who would assert that any person totally blind from birth, that is, any person who never has seen and never can see, can have an education comparable with that attainable by a person of normal vision and equal mental endowment; to attain to an identical education is, of course, simply out of the question.

The Seeing Organ

We see normally with two eyes; it is even truer that we see with the body as a whole and with our environment; that is, that sight depends not only on the eyes and the central nervous system but also on position, on muscular control, on where we are and the time of day or night, and on health and bodily and mental tone. The mechanism as mechanism is one of astounding complexity; a Hoe press, man's most intricate mechanical achievement, has a few thousand parts and their harmonious working must be guarded by unceasing vigilance lest a single screw get loose; the eyes and their connections in muscle and nerve tissue involve the interrelation of millions of cell structures, each more complex than a Hoe press, and yet the mechanism has not a single pressman or mechanic to watch over it, and it may run for eighty years without outside intervention or adjustment.

It should be stressed that we really see with our brains and not just our present brains but our own past experience and our ancestral brains as well. The fact that vision is, for good or evil, largely a matter of mentality, is shown in the tests to determine the reliability of witnesses. The average person fails to see many objects present at a given time in a given area; he fails to get the relation of the objects to each other and frequently adds objects that are not there or confuses one object with another. No person can ever be so well trained that he "sees all there is to see." Complete seeing depends then on a very thorough education, which the usual visual instruction utterly fails to give because it fails to take into consideration the visual organ as a whole and appeals only or chiefly to the eyes.

In much of this appeal, even the eyes are not understood. Only recently has the fact of macular vision in the primate eye been studied and properly stressed. G. Elliot Smith was among the first to show how important for intellectual development is the existence of centralized vision in the *macula lutea* and how the clearness and definition made possible by the existence of this super-organ of vision enables its possessor to examine with minuteness and precision what the sub-primate groups see only in a casual and general way. Our own peripheral vision is appealed to chiefly by motion—we cannot examine an object with any degree of

success outside of the focal area. The nature of this kind of vision is shown in the "hush" of all wild things in the presence of a moving terror—the lion, for instance, or man; when the motion ceases, the jungle or swamp or woodland gradually comes back to life again. The stalking of game is another instance in point; it is motion that the deer sees rather than a dog or a man with a gun, and he can be fooled almost completely by the cessation or reduction of motion unless he hears or gets wind of his pursuer. Of almost equal importance in the primates is the fact of binocular vision and the delicate correlation and adjustment of two-eye movements. So-called stereoscopic vision is second in importance only to macular vision; and the human has, in macular and binocular vision and in the brain and experience correlations, a possession so precious that to abuse it is to commit the worst of follies.

Seeing and the Environment

From the evolutionary point of view, sight is a result or product. Certain modified cells in the dermal structure of certain plants and animals have a special sensitivity to light. Response to light follows its special focusing or condensation. From these simple structures and responses it is a far cry to the human eyes but the steps are nearly all present in a graduated series and the stimulus of light is evident in every modification. While the unity and inner self-adjustment of the organism are equally evident, the fact of light as a major factor in the environment is reflected to such an extent that it sometimes looks as if some supreme Light had sketched a perfect pair of eyes and then worked toward them, dropping or discarding the imperfections and the failures along the way. Further, the many-sided influence of light almost justifies the expression, "If thine eye be single, thy whole body is full of light." Dr. Haines traces alertness largely to light stimulus. Without light the world is narrowed to a sphere six feet in diameter, the world of immediate contacts, for sound gives us little impression of distance or direction, smell still less; and sight, hearing, and smell are the only distance ceptors (Crile). With light our environment becomes virtually unlimited in the space-time continuum: light makes possible the perception of bodies a hundred million light years distant—the new 200 inch telescope will extend the range of

vision to probably a thousand million light years; and almost equally it renders possible a knowledge of the past. No sound comes out of the past, for sound is intensive and momentary. We can only meagerly reconstruct past human languages from visual materials; we cannot know definitely how Latin, for instance, was spoken by Caesar but we can read Caesar's written, i. e., visual, words two thousand years later. The phonograph makes only a slight change in this situation, because of its limitations. Books, on the other hand, multiply, and our heritage of visual material grows beyond the dreams of our ancestors. Books, more than any other device, preserve all that is most precious in our human heritage and make the past live in the present. All books are preserved light, except the merest fraction—those in the touch systems.

Light itself from the physical point of view is a very tenuous thing. It may be looked upon as a rhythmic disturbance of an hypothecated ether; similarly, as a rhythmic displacement or as a change of field, the duration being almost infinitesimally short. So conceived, light is reduced to a mathematical concept, existing in the brains of physicists and mathematicians. Real light is a physiological and psychological effect. In plants and lower animals the effect is more restrictedly biochemical; in higher animals and pre-eminently in man the effect passes over into the psychological. In the highly cultivated human, light effects become most intricate and are correlated in experience in such a way as to render analysis all but impossible; that is one reason why psychologists prefer to experiment with rates! Perhaps the highest effect of light is to be found in its relation to the continuity feeling which J. B. S. Haldane makes the supreme test of conscious life.

Lighting and Seeing

It is all-important that the eye as organ of sight and light as its medium be brought together in the most effective way. Mankind up to some few thousand years ago—a mere moment in cosmic time—saw only by natural light, sunlight chiefly or reflected sunlight in lunar and planetary light, very dim starlight, the night glow of volcanoes, the momentary flash of lightning, the faint gleam of firefly or glowworm. Campfires were the first venture in artificial lighting, then torches, candles, oil lamps and on to gas and elec-

tricity. Effective lighting came only with the gas mantle and recent types of electric lighting. Earlier man's world was, too, a green world, a world restful to the eyes because it and eyes had grown up together and eyes were hence made for a green world. But with "modern" life all this is changed; the great majority of persons now live in cities where they see little of the natural greens, browns, greys, cobalts and so on, by nature's own sunlight; rather they dwell in a world of glares and of half-lights. On a bright summer day in full sunlight one sees with an intensity of 10,000 foot-candles; in extreme cases natural light may rise to a brightness of 15,000 foot-candles; even in the shade of a tree in the open the intensity is still 1,000 foot-candles. Under the more natural conditions, too, such as plowing in a field, picking fruit or fishing, man has to contend with little glare and his visual accommodation is sufficient for all purposes. Looking into an automobile headlamp at a combined speed of 90 miles an hour—just the highway limit, be it noted!—is a very different matter. Things may happen due to overstimulus or faulty reaction, and happen very quickly. But faulty and deficient lighting may be worse than glare. Many watchmakers and most readers undertake an unnatural and most exacting task under conditions calculated to put a severe strain upon even an accommodating and resilient organ. Long continued and repeated abuse will wear out the best of servants.

Recently there has come into being a new genus of experts, with many species, the illuminating engineers. It remains to be seen whether they are truly enlightened themselves, with no intention of serving sinister purposes. They not only promise to do an immense service in determining optima of quantity and quality in the supply of natural or artificial light, evenness of lighting effect and so on, but they ought soon to be in a position to enlighten public opinion and gradually force printers, paintmakers and other manufacturers into hygenic and ethical practices. Hail to a new profession and more power to them!

The Educational Program

Education has come to mean so much more than schooling that one almost has to define the term before he can use it without danger of misunderstanding. If then the writer of this paper is

referring primarily to a school program in what follows, he has in mind, nevertheless, the many ramifications of the subject—parental education, education of the general public, a campaign of general enlightenment, bringing together expert knowledge from all possible sources, and, not least, the effecting of what can be done through legislation, city ordinances and local regulation. In laying down a seven point program, then, he wishes to be understood as speaking chiefly for schools but also as implying a much more comprehensive program.

1. Our boys and girls should first know something of the structure of the eyes, their powers and possibilities and their limitations, and also that we see best with a pair of eyes exactly co-ordinated and further co-ordinated as a pair, with nervous, muscular and bone structure.

2. The practice of personal hygiene should be taught as including the care of the eyes and the fact that should be especially stressed is that such care extends to matters like eating, drinking, smoking, etc. Children should be made acutely aware of the fact that some drugs make us see double or otherwise give distorted and unreliable images.

3. Everyone should be taught not to rely upon self-diagnosis or any partial type of examination but to seek the best expert advice in correcting any anatomical defects or physiological disturbances of vision. They should further be taught that repeated examinations may be essential to eye health.

4. Properly conditioned environments with regard to the sources, modifications and quantity of light are very important.

5. The selection of educational materials should involve the questions of color, glare and contrast. This means not only the selection of the best materials from the visual point of view but the arrangement of all educational objects and materials to insure the best possible lighting effects.

6. Quickness of visual reaction should be stressed. Prompt and precise response is vitally important in a machine age, especially in the exacting conditions of traffic on crowded thoroughfares.

7. Everyone should have a glimpse into the ramifications and correlations of the above. The relation of lighting and seeing to commerce and industry, home life, art, daily contacts and the

enjoyment of nature should be taken up seriously and extensively. Above all it should be made clear that the lighting-seeing relationships are literally vital in planning one's life, both to secure and to give a maximum of worth. Light, sight and the fine art of living are inextricably intertwined.

What Can the Blind Do About It?

Surely no group is so acutely aware of the value of sight as those who have lost their own sight either wholly or in part. The extremely rare person who is born blind and has never seen may well develop an experience into which no element of sight enters directly and hence may profess only a mild curiosity as to what light and sight may be like, but anyone who has had the experiences of sight or retains them in part, is more in a position to appreciate the full meaning of vision than one to whom such experiences are commonplace. The blind and the partially blind can, then, speak with a fulness of meaning which is bound to be impressive and to add momentum to the sight conservation movement.

Some may recall that one of the early exponents of the Newtonian theory of light was a blind mathematician. I have personally heard another blind mathematician give a clear and concise explanation of propagation of light, angles of reflection, refraction and other light phenomena to those who could see. After all, intelligence is the true Light and loss or lack of sight only challenges intelligence, does not destroy or defeat it. The blind may therefore be requested to bring their experience and enlightenment to the cause of better vision, the conservation of all sight, and the increase of insight.

Eye Conditions Prevalent in Early Adult Life*

Wm. F. C. Steinbugler, M.D.

THE author outlines the symptoms and treatment of those eye conditions which usually appear between the twentieth and fortieth years of life

IN considering eye conditions prevalent in early adult life, the span of years from 20 to 40 has been included, and it was deemed advisable to classify them according to: (1) developmental disorders; (2) focal infections; (3) systemic disorders; (4) muscle imbalances; (5) tumors; (6) drugs and beverages.

Developmental Disorders—Keratomalacia

In analyzing developmental disorders, those due to nutritional disturbances and those due to the onset of hereditary lesions must be considered. An example of the former is the so-called keratomalacia, or softening of the cornea which occurs in persons whose food is poor in fat content, where there is an insufficient absorption of fat, and in some liver conditions. Fortunately, it is seen very rarely in this country, but is observed in Russia, where the fasts are long. Cod liver oil is almost a specific in the treatment.

Interstitial Keratitis

Of the hereditary conditions which may make their first appearance at this time, probably the most important is interstitial keratitis, due to inherited syphilis. As a general rule, the symptoms come to the fore earlier in life, but they may be delayed until after the twentieth year. The disease is usually bilateral, both eyes being involved at the same time, and there is marked impair-

* Presented at the Institute on Conservation of Vision, Brooklyn, N. Y., April 16, 1936; arranged by the Bureau of Prevention of Blindness of the Division for the Blind, New York State Department of Social Welfare; and sponsored by the Eyesight Conservation Committee of the Brooklyn Health Council; Medical Society, County of Kings and Academy of Medicine; and the Brooklyn Ophthalmological Society.

ment of sight with cloudy cornea, redness and intolerance of light. The cloudiness of the cornea, when it occurs near the periphery, is followed by vascularization, giving rise to the so-called "salmon patch." There are, as a rule, some of the other associated symptoms and signs of the inherited disease present, the most common of which are: (1) Hutchinson's teeth—a notching of the upper central incisors on their cutting surface, or peg-shaped upper lateral incisors; (2) catarrhal deafness; (3) scars at the angles of the mouth; and (4) high arched palate. The interstitial keratitis, deformed teeth and catarrhal deafness are referred to as Hutchinson's trilogy, indicative of inherited syphilis. Fortunately, the cornea in most cases loses its cloudiness, so that a fair degree of vision is retained, normal vision not being an infrequent finding following an attack, the customary duration of which is from six to twelve weeks. At this time of life the first symptoms of the hereditary retinal degenerations may put in an appearance. True, some of them can be recognized earlier by means of the ophthalmoscope, but the actual interference with sight and the symptom most commonly found—night blindness—may not be complained of before the third decade. Of this group, the outstanding example is retinitis pigmentosa. As previously stated, the chief complaint is night blindness, and the most important eye findings are a progressive atrophy of the specific elements of the retina and a deposit of pigment which lies in front of the blood vessels. A late complication is a posterior cortical cataract, and these cases usually progress to blindness, which does not ensue, however, until after the lapse of many years. Up to the present time treatment has been of no avail.

Focal Infection

We next come to the large group of focal infections and these seem to be most prevalent early in adult life. Focal infection has been defined as a metastatic, systemic or local condition due to infectious micro-organisms or their toxins carried in the blood or lymph stream from a focus or foci of infection. A focus of infection is a localized or circumscribed area of tissue containing pathogenic micro-organisms and may be either primary or secondary. The most common foci of infection are: (1) the teeth; (2) the tonsils;

(3) the middle ear; (4) the nasal accessory sinuses; (5) the gastro-intestinal tract, including the gall bladder and appendix; (6) the genito-urinary tract, usually the prostate and seminal vesicles in the male, and the uterine mucosa in the female. The parts of the eye most frequently involved as the result of focal infection are: (1) cornea; (2) iris; (3) ciliary body; and (4) choroid. In all eye conditions where a focus of infection is suspected, a careful search should be made for it, the X-ray being used if necessary, and the cause eradicated. That focal infection is often the only cause of an eye condition is definitely proven by the following history of an illustrative case:

K. F., single, female, aged 35, first seen June 25, 1918, complaining of redness and pain in the right eye of one week's duration. Had two previous attacks, the first two and one-half years before, lasting eight weeks, the second five months before, lasting five weeks. Clinical picture, acute iritis right eye. Wassermann negative. July 1, 1918, right upper first bicuspid removed. July 9, 1918, fresh infection. August 12, 1918, some more teeth extracted. Slight recurrence in same eye in January, 1920, at which time three more teeth were extracted. Patient has remained free of trouble since—a period of over 16 years.

To guard against the possibility of focal infection causing eye trouble in adult life it is a good plan to have diseased tonsils removed during childhood and to have a semi-annual check-up of the teeth by a competent dentist.

Iritis

As the most common eye disease occurring as the result of focal infection is acute iritis, it might be well to say a few words about it. It is essentially a disease of early adult life, rarely seen in children and rather infrequently in the aged. Besides being caused by foci of infection, it may be due to many systemic diseases, chief among which are syphilis and tuberculosis, to metabolic disturbances, such as diabetes, gout and thyroid disorders, to injury, and as the result of sympathetic inflammation. The male sex seems to be affected more than the female, and the symptoms complained of are usually pain, redness, tearing, intolerance of light and diminution of vision. The pain is situated not only in the

eye itself, but radiates to the parts in the vicinity, especially the bony region above the eye, and has a marked tendency to be worse at night. On examination of the eye, two groups of signs present themselves. The congestive group, due to the increased vascularity of the iris, which consists principally in a change of color of the iris—causing a blue or gray iris to appear greenish, but not being so clearly seen in the darker colored eyes—and, at times, the ability to recognize individual blood vessels. There is also narrowing of the pupil caused by the dilatation of the iris due to the fulness of the vessels and a spasm of the sphincter produced by the irritation. The other group of symptoms is caused by the presence of the exudate. This is a serous or serofibrinous fluid which is poured out into the substance of the iris and the anterior and posterior chambers of the eye. The exudate in the iris aggravates the discoloration and the loss of pupillary reaction, while that in the anterior chamber causes a cloudy appearance of the aqueous, demonstrated by passing light through the pupil. This area normally appears black, but in iritis it is gray. When the particles which float in the aqueous sink to the bottom, a clearly defined yellowish mass is seen. At times when congestion is extreme, a collection of blood may be seen in the same location. The exudate poured out into the posterior chamber is not accessible to direct observation but shows itself in the form of adhesions between the iris and the anterior capsule of the lens which lies directly behind it. These cause the pupil to be irregular in shape, a fact which is demonstrated when atropine is instilled into the eye, and may, by interfering with the passage of the intraocular fluids, cause an increase of tension.

There are two eye conditions for which iritis is frequently mistaken, namely, conjunctivitis and acute glaucoma. There should be little difficulty in distinguishing an iritis from a conjunctivitis, which, in its acute form, is at times referred to as "pink eye," because of the presence of a mucous or a mucopurulent discharge, but, as the treatment of an acute glaucoma is exactly the opposite to that of an acute iritis, it may be a matter of serious import if this mistake in diagnosis is made. In general, glaucoma does not appear before the fiftieth year of life, but the important points of differentiation are that in iritis the pupil is smaller than normal and

the tension of the eye is normal, or only very slightly increased, whereas in glaucoma the pupil is wide and the tension is markedly increased.

Systemic Disorders

We now come to a discussion of eye conditions seen as the result of systemic disorders. This particular group covers almost the entire field of ophthalmology and, needless to say, only the more important ones can be reviewed. For the purpose of ease of presentation they have been divided as follows: (1) diseases of the respiratory system; (2) diseases of the digestive system; (3) diseases of the cardiovascular system; (4) diseases of the genito-urinary system, including the so-called social diseases—syphilis and gonorrhea; (5) diseases of the nervous system; (6) metabolic disorders, including diseases of the ductless glands; (7) infectious diseases.

Respiratory System

In diseases of the respiratory tract—especially those associated with high fever and, very frequently, following a severe catarrhal condition of the upper air passages, with or without sinus involvement—a corneal disease known as herpes is often encountered. The initial symptom may be sharp pain, resembling that caused by the entrance of a foreign particle into the eye, followed rather shortly by redness and tearing. At times the corneal process shows a treelike distribution to which the term dendritic keratitis has been applied. If not promptly recognized and combated with proper treatment, there is a tendency to spread, and the centre of the cornea, over the pupil, may be involved, leading to the formation of a scar with subsequent visual impairment.

Associated with diseases of the nasal accessory cavities—the sinuses—there may be local involvement, resulting in periostitis or optic nerve pressure, giving rise to the so-called retrobulbar neuritis because of the fact that the optic nerve back of the eyeball is the part affected. This, in the acute form, causes marked and sudden diminution of vision and calls for prompt action in opening and draining the offending sinuses. The immediate and complete cure resulting therefrom is often little short of miraculous.

Digestive System

Reference has already been made, under the heading of focal infection, to the part teeth play in the production of eye diseases. The most frequent symptom of diseases of the liver and bile passages is jaundice, the first indication of which shows itself in the discoloration of the whites of the eye. In chronic jaundice the eyelids show the presence of superficial yellowish tumors which grow very slowly, never change their benign character and are removed only for cosmetic reasons. The symptom of night blindness is well recognized in diseases of the liver.

Cardiovascular System

Bleeding into the whites of the eyes, the so-called "subconjunctival hemorrhages," while it is usually regarded with a great deal of apprehension, is not of serious import. Such hemorrhages are usually caused by the external condition or as the result of physical exertion and resorb without leaving any trace of visual impairment.

More grave are the sudden, partial or complete losses of vision in one eye which are the result of embolism or thrombosis of the central retinal artery. The degree of visual loss is dependent on whether the main trunk or one of its branches is occluded. This occlusion is promptly followed by nutritional disturbances and tissue changes in the retina, which, after a very brief time, are not capable of recovery. In cases of this nature a prompt widening of the vessels to permit the re-establishment of the circulation of blood is the end aimed at. This may be brought about by vigorous rotatory massage of the eye through the lids after the vessels have been temporarily widened by the inhalation of amyl nitrite. If this fails to bring about the desired result, the fluid in the anterior part of the eye should be drained off. This operation is known as paracentesis and the manner in which a favorable result is effected is in the sudden reduction of the intraocular tension caused by the rapid release of the fluid. In an attempt to maintain normal intraocular pressure, fresh blood quickly enters the eye, and this entrance of blood will, at times, cause the dislodging of the clot causing the obstruction and resulting visual impairment.

Inasmuch as the blood vessels of the eye are the only ones in the body which can actually be seen, many circulatory disorders can be diagnosed in this way, chief among which is arteriosclerosis.

Diseases of the Genito-Urinary System, Including Syphilis and Gonorrhea

Swelling of the lids is a well-recognized symptom of nephritis. It recurs, remains for a few hours or days at a time and then disappears. In the course of nephritis, the most important involvement of the eye is albuminuric retinitis. As the name would imply, it is an inflammatory state of the retina, characterized by hemorrhages and particularly by processes depending upon fatty degeneration. The general symptoms consist of headaches and gastric disturbances, accompanied by well-marked pallor, and the quantity of urine voided is large, of low specific gravity, greenish yellow in color and contains a slight quantity of albumin and no sediment.

In nephritis of pregnancy there may be severe retinitis, which shows itself as a rule during the last four months. It generally occurs in the first pregnancy and only occasionally in a later one without symptoms in preceding pregnancies. For the most part, there is complete return to normal, but optic atrophy may ensue.

In uremia there may be sudden, bilateral, complete loss of sight, with cerebral symptoms, convulsions and suppression of urine. The eye grounds are usually normal on examination except when uremia complicates an albuminuric retinitis. The attack lasts 12 to 24 hours and after two to three days vision returns to the previous state. It is seen more frequently in acute nephritis following scarlet fever than in chronic nephritis, pregnancy or labor.

Syphilis

When an analysis of eye conditions as to their etiological factor is made, it is astounding to learn what a large percentage is due to this cause. It is responsible for two per cent of all eye diseases and attacks almost every part of the structure of the eye which may be the site of entry for the general infection of the body, although more often it is secondarily involved. Both eyes are affected in

nearly 50 per cent of the cases. It is interesting to note the percentages of positive blood tests. In inherited syphilis, the test is practically always positive, remaining so in spite of treatment. In acquired lesions, the percentage is much less, while in the tertiary or late stages only 50 to 75 per cent are positive. The parts of the eye affected also influence the blood test. In interstitial keratitis, an inherited form, the reaction is positive in 88 per cent; iridocyclitis, 50 to 60 per cent; choroiditis, 23 per cent; optic neuritis, 30 per cent; primary optic atrophy, 100 per cent; oculomotor paralysis, 52 per cent. Of six cases of paralysis of the sixth nerve there was not a single positive reaction. Among extragenital chancres, the eyelids are represented by three to four and one half per cent, the favorite site being at the junction of the skin and conjunctiva near the inner angle of the eye. There is the usual swelling which later ulcerates, causing a conjunctival discharge, resembling an acute conjunctivitis. The lymph glands in the neighborhood are swollen. The positive diagnosis can be made by finding the exciting cause—the spirochetae—in the secretion from the ulcer. Secondary and tertiary lesions appear on the conjunctiva as on mucous membranes elsewhere. Reference has already been made to interstitial keratitis, which is usually an inherited condition, being seen in only three per cent of the cases of acquired syphilis.

The fifth nerve may be paralyzed, giving rise to a neuro-paralytic inflammation of the cornea which, because of the fact that it has lost its sensation, often ulcerates, with subsequent perforation and loss of the eye. The iris, sclera, choroid and retina may be the seat of inflammatory processes and the extraocular muscles may be paralyzed, but more important are the optic nerve conditions: optic neuritis with resulting secondary atrophy and primary optic atrophy in locomotor ataxia and general paresis, usually leading to incurable blindness.

Gonorrhea

If it is true that approximately 10 per cent of the population is infected with syphilis and perhaps a greater number with gonorrhea, it is both fortunate and surprising that so little gonorrheal conjunctivitis is seen. This inflammation is the direct result of the

invasion of the conjunctiva by the gonococcus, the primary source of infection usually being the urethra. Within 48 to 72 hours there are swelling and infiltration of the membrane with occasional croupous membranes and a clear, watery, meat-infusion-like discharge. This soon becomes purulent and is present for about ten days to two weeks, at the end of which time the discharge becomes catarrhal. The important complication is the corneal affection, which may be benign or severe. In the latter case an ulcer forms rapidly and the entire cornea may be involved. The corneal tissue melts away and an iris prolapse results with marked or total loss of vision. In the treatment of this disease it is imperative to obtain a culture of the secretion at the earliest possible moment as the gonococcus can be identified with comparative ease. Energetic treatment must be instituted at once, as there is no time to lose in the fight against ulceration.

There is a metastatic form of gonorrheal conjunctivitis in which the discharge is not purulent and which is associated with joint complications.

Iritis may also be found as the result of invasion by the gonococcus. It may be unilateral or bilateral, is usually metastatic and does not lend itself to treatment as readily as iritis due to other causes, because of the fact that there are frequently associated diseases of the deeper structures which cause visual impairment.

Certainly with so large a percentage of eye cases due to syphilis and gonorrhea exacting such a tremendous toll of visual power, every effort should be made to spread the knowledge concerning these two ravages and a determined fight should be waged on all fronts to eradicate, as far as possible, these two great menaces to the human race.

Diseases of the Nervous System

The optic nerve and retina of the eye must be looked upon as a direct continuation of the brain, and, as a result of this anatomic relationship, the eye and the nervous system are closely associated. Brain tumors and abscesses are frequently diagnosed from an examination of the eye, 80 per cent of the former showing some definite change in the eye background. Many eye muscle paralyses will point the way towards clearing up some cerebral condition,

and defects in the visual fields are of great importance in localizing brain lesions. Cerebral syphilis and the so-called metasyphilitic diseases—tabes or locomotor ataxia and general paresis—also have a multiplicity of eye symptoms.

Head injuries resulting in fractures of the skull, particularly the base, are associated with eye symptoms because of the location of the optic nerves and the central optic pathways.

Metabolic Disorders, Including Diseases of the Ductless Glands

The most important of the metabolic disorders is diabetes, which is essentially a disease of later life, but which is not infrequently seen during the years under consideration in this paper. From 20 to 33 per cent of diabetics have eye complications, and cataracts form 30 per cent of these. Occasionally a diabetic will notice that the glass that has been worn with comfort over a period of time suddenly becomes inadequate. This is probably due to a change in the refractive index of one of the media of the eye and calls for a checkup of the sugar content of the blood. When this has been taken care of, the refractive error usually returns to its former state. Iritis and retinal hemorrhages are other eye complications of diabetes.

Of the ductless gland conditions—those glands having an internal secretion—the best known is goitre, and the form in which the eyes are involved—the so-called exophthalmic goitre—merits attention. It occurs most often between the twentieth and the fortieth years of life, and women are affected more often than men. Heredity, nervousness and hysteria predispose one to the disease, although a psychic or mental shock often serves as the actual cause. The predominant symptoms are the prominence of the eyes, the presence of a tremor, the tumor of the thyroid gland and a rapid pulse. It must be borne in mind that there may be an involvement of one eye only. The eyes at times become so far displaced forward that the lids fail to close over them, and because of exposure of the eyeball, especially during sleep, a drying of the cornea with resultant ulceration may ensue.

Lesions of the pituitary gland situated at the base of the brain have definite eye symptoms, particularly referable to the visual fields, which show a bilateral loss of the temporal halves. Tempo-

rary disturbances of this gland occur during pregnancy but there is usually complete restoration to normal.

Infectious Diseases

Reference has already been made to a number of the more important infectious diseases, and under this heading tuberculosis alone will be presented. In tuberculosis, the eye is infected either directly or indirectly, more often the latter. The direct infection is either in the lids or the conjunctiva, or may also be an extension of tuberculosis of the face. In active pulmonary tuberculosis, eye complications are rare. Patients with eye tuberculosis may give a suspicious family history, or tell of some eye trouble early in life, but the majority of them appear in blooming health. In every chronic eye trouble of unknown origin tuberculosis must be suspected, and with the advances made in the detection of these cases with tuberculin, many positive diagnoses are possible. Ocular tuberculosis involves the conjunctiva in the form of ulceration, characterized by the presence of granulation tissue. In the cornea, various forms are seen, one closely resembling the interstitial keratitis of inherited syphilis. The scleral involvement, which is secondary to iritis, shows itself in the form of circumscribed red and painful areas which may disappear entirely. Involvement of the iris may result in a discoloration of it, giving rise to the condition known as *heterochromia iridis*, in which the two eyes are of different color, the lighter one always being the one affected. In the interior of the eye, choroiditis and retinitis are seen, and retinal detachment may be secondary to the former. In young adults, repeated hemorrhages in the vitreous and retina are another manifestation.

Fortunately, many of the forms of ocular tuberculosis lend themselves to treatment with tuberculin and startling cures have been reported as the result of the use of this exceedingly valuable therapeutic agent.

Muscle Imbalances

Improper muscle function, unless it is due to paralysis of an individual muscle, to which reference has already been made, should be incorporated with errors of refraction and will be pre-

sented elsewhere in the symposium. However, it might be well to emphasize the fact that eye symptoms arising in the course of one's daily occupation call for a careful study for the possible detection of an error of refraction and its prompt correction by adequate glasses. In this connection, it might be noted that the question of proper lighting, long neglected, is at last beginning to receive the attention it merits.

Tumors

The early detection of a tumor of the interior of the eye is very difficult, and any unexplained symptom of the eye, particularly if it interferes with vision, calls for repeated and careful examinations. The tumor of the eye most frequently found in adult life is the sarcoma of the choroid, which may, at times, be extremely malignant and cause secondary deposits in the liver and lungs with subsequent fatal outcome. There is no way in which this early spread can be detected, so that as soon as the positive diagnosis is made the eye should be removed.

Drugs, Alcohol and Tobacco

Of the drugs in common use affecting the eye, probably the best known is quinine. Of late years, owing to the fact that we rarely encounter malaria in and around New York City, the administration of this drug has been curtailed. It causes visual disturbances by affecting the optic nerve and the retina in a characteristic way. While the dose required to affect the vision is usually quite large, the English authors, Collins and Mayou, report a case in which defective sight was produced by the administration of five grams, the equivalent of 75 grains, over a period of 38 hours, and 12 grains has produced decided temporary diminution of vision in a susceptible and neurotic woman. Blindness is usually not permanent, but a marked loss of sight may persist. The condition is always bilateral.

In poisoning by lead there may be visual impairment, but the most common disturbance is paralysis of an ocular muscle.

The changes in the eye due to poisoning by salicylic acid or its derivatives, one of which is aspirin, are similar to those seen as

the result of quinine poisoning but much less severe, as no cases of blindness have as yet been reported.

Atropine poisoning, due to the internal administration of belladonna, usually for some gastro-intestinal disorder, the external use of a plaster to combat local pain, or the instillation of drops for some eye condition, manifests itself by a very wide dilatation of the pupils, inability to read material close to the eyes, a rapid pulse, dryness of the throat and flushed face. If the administration is continued, there may be mental disturbances, even delirium. Where an idiosyncrasy exists, the instillation of atropine in the eye may cause itching and formation of follicles in the lids, or a severer reaction in the skin, at times resembling erysipelas.

Meat poisoning, especially the condition known as trichinosis, due to eating infected pork, may show itself in the form of puffy eyelids.

During the past few years a reducing agent known as dinitrophenol has been much in vogue. Its action is dependent, in part, upon increased metabolism and loss of fluid from the body in the form of perspiration. This is a very dangerous drug, since several cases of cataract have been reported as the result of its use.

Of all the poisons affecting the eye, alcohol is probably the most frequent. Ethyl alcohol is the form in which it is usually taken, although, during the era of prohibition, poisoning with methyl or wood alcohol, was not infrequent. The reports of sudden death or total blindness were often seen on the front pages of our newspapers, especially following New Year's parties. Ethyl alcohol poisoning of the eye occurs in a chronic form, as the result of imbibing whisky and brandy, and is practically never seen in beer or wine drinkers. The effects of alcohol are rarely seen before the age of 35 and most often in patients who also use tobacco. The first complaint is usually of fogged sight and later there is actual and marked visual impairment. The course is chronic, lasting for months or years. The prognosis, as regards blindness, is good. There are periods of improvement following abstinence from alcohol, but as soon as the drinking is resumed, the condition once more progresses. A characteristic finding is a central defect in the visual field and, in severe cases, no appreciation of red and green.

Tobacco is harmful to the eye because of its nicotine content. Its effect is similar to that of ethyl alcohol. Cigarette smoking seems to be the least harmful, strong cigars and pipe tobacco being the chief toxic conveyors. It occurs, as a rule, only in individuals who begin to smoke before the twenty-first year and symptoms appear from the fortieth year on. Up to the present time few cases have been reported in women but, as their habits with regard to the cocktail and cigarette have undergone a radical change during the past 20 years, we should expect to find mention of some in the literature soon.

In conclusion, let me emphasize the importance of securing prompt and efficient medical aid whenever eye trouble presents itself. Being a possession of such great value, only medical men specially trained for that purpose should be entrusted with the care of our eyes.

Occupational Adjustment of the Visually Handicapped*

Eleanor Brown Merrill

IN considering how best to help in getting the right work for the visually handicapped, it is necessary to draw on the experience of rehabilitation and employment service, hospital social service, occupational therapy, work for the blind, industry, education and vocational training

LET me say, first of all, that in discussing occupational adjustment of the visually handicapped I refer to the partially sighted and not to persons classified as blind. There is overlapping in some instances of failing vision, when a progressive condition indicates the prospect of ultimate blindness and the need for adjustment to an altered future with more limited opportunities.

If the eye condition is such that a life of blindness must be faced, there may be upheaval in the whole world of the individual; beside the economic element involved, a need for entire change in habit, thought, recreation and interest may be demanded. The medical case worker knows this situation only too well, and I have drawn upon material from a hospital social service department as illustration:

A man of fifty, formerly a dye maker, was referred to social service, having been unemployed for two years. Though under treatment in both the eye and syphilis clinics, sight was gradually diminishing due to glaucoma and optic atrophy of luetic origin, and the doctors could offer only an unfavorable prognosis. Always a good provider, this man's desperation on finding himself unable to support his wife and dependent daughter and his panic as to the future can be imagined. Fine and patient work over a long period was required to bring about an understanding and acceptance of the situation, a belief in the medical treatment required, a willing-

* Presented at the National Council on the Physically Handicapped, Atlantic City, N. J., May 28, 1936.

ness to receive temporary relief, and co-operation in a plan for training through the Workshop for the Blind and the Goodwill Industries. The final result was re-establishment in a wage-earning capacity as shoe cobbler, with renewed self-confidence and family pride.

In bringing about a better adjustment to life, each person coming in contact with the visually handicapped individual has his part to play. The family, the friend, the doctor, the counsellor, the employer, the case worker, the occupational therapist, the teacher, all must share in this responsibility; and more concerted thought must be given to the problem of economic adjustment. Vocational guidance in this specialized field has not as yet got very far, though with increasing emphasis on the need and more general participation in a rounded program, there is ground for encouragement. In "A Study of Occupations of Partially Sighted Boys and Girls" by Marguerite Kastrup, published by the National Society for the Prevention of Blindness, the author makes many suggestions in answer to that ever present question in the minds of teachers—"What can children with seriously defective vision do after leaving the sight-saving class?" Miss Kastrup gives a fairly bright picture of the field open to those with poor vision, taking into account visual limitations and occupational hazards in relation to eye difficulties. Positions in factory work, selling, personal and professional service, and outdoor work of various kinds are among the opportunities suggested for both myopes and those designated as low visioned. The proportion of pupils employed, as shown in this Cleveland study, was gratifying. In general, however, there seems much need for convincing employers that persons with but partial vision can satisfactorily fill positions of any kind. There is an objection to employing the handicapped which is hard to overcome, but a right approach to the employer can accomplish much in obtaining his interest and understanding co-operation.

Let me cite another instance gathered from the records of a hospital social service department:

Mr. Blank was admitted to the hospital for a cataract operation which brought sufficient vision to the operated eye with glasses for doing simple clerical work, though the second eye was sightless; an elderly man, he had been employed by a mercantile agency for over

ten years when he was discharged for incompetence which the manager did not recognize as due to failing vision. In learning later of the man's financial difficulties, the manager undertook to personally assist with rental of the home, but the family was averse to any approach being made as to re-employment, thinking of him as "cross" and uninterested. When informed, however, of Mr. Blank's eye condition, the company was glad to take him back on its payroll, saying: "If Mr. Blank has sufficiently good vision for work that will not tax the eye too severely, we will do all in our power to take care of him."

The Western Electric Company is an organization that has recognized a responsibility for employing a certain proportion of handicapped workers, believing that emphasis should be put on ability to perform useful service rather than on vocational defects. The need for careful guidance and placement with a view to the disability involved is not overlooked, and one must recognize the impracticability of going beyond a certain point of saturation in employment of the physically handicapped. In reporting on the Company's experimental work along this line, however, Mr. J. W. Dietz indicates that the additional cost of follow-up procedure to insure suitable placement might be offset by the advantage of securing a more stable group of employees. The occupationally secure may have less urge to present satisfactory performance, feeling that other jobs will be ready if the present one is lost.

It was interesting recently to hear the matter of selection from the standpoint of industrial value rather than from that of the particular handicaps involved, emphasized at an Institute on Conservation of Vision arranged by the Bureau of Prevention of Blindness of the New York State Division for the Blind. Mr. O'Toole spoke for the Department of Guidance and Placement of the New York City Schools. He contended that instead of thinking in terms of what vocations might be available for sight conservation pupils, we should approach placement from the standpoint of how these pupils can be adjusted to the vocations in which they are interested. Certainly we must weigh employment opportunities against the limitations of reduced visual efficiency; we must take into account the fact that only a given number of visually handicapped can be absorbed in the industrial and commercial fields. However, there is no question but that more consideration

should be given to the importance of real case work with these applicants for placement and of getting to know not only their abilities, but their tastes, ambitions and inclinations.

Since the age of seventeen, some years ago, Julius B. has been under the care of rehabilitation service. Further medical examination confirmed the original diagnosis of horizontal nystagmus, high myopia and a partial atrophy of the optic nerve with visual acuity of 20/70 in both eyes after correction. The condition was not considered progressive and in view of Julius' strong ambition to specialize in the mechanics of aeronautics it was felt better to encourage him in this interest than to try and steer him into another line of work. Julius showed marked intelligence and alertness in the use of his limited vision, and by judging him and his potentialities on this individual basis, the ophthalmologist saw no danger in the period of training necessary nor in following the boy's desires as to placement.

Mention has been made of the value of training available through Federal-State Rehabilitation Services. This may be given either on an apprenticeship basis or in advance preparation for a particular job, and it affords a splendid opportunity to develop sound and permanent programs. Such counselling services as can be provided also through rehabilitation departments can establish confidence in the mind of an applicant, re-awaken buried hopes and develop optimism that, in company with practical guidance along the path of opportunity, will bring about mental, social and economic adjustment to a surprising extent.

I am inclined to think that through consultation with the ophthalmologist, who must be final judge as to proceeding with visual safety, the partially sighted can be fitted into those occupations which they have wanted to follow more often than is generally realized. However, it is very true that with the right approach new interests can be aroused and an individual happily adjusted to a line of work quite different from that originally undertaken. Again I turn to hospital social service for illustration.

A man of 30 with wife and small child was discharged from the eye ward with 20/200 vision in both eyes, the diagnosis having been ulcers of the cornea. His old job of guard on the subway was not available because of his impaired vision; and, furthermore, the doctor advised a life outside of the city, in view of his repeated

ocular attacks. Finally a position as butler in a country home was secured, with the arrangement that his wife should do the cooking, and both were given the necessary training. Vision improved to 20/70 and the couple remained self-supporting and happy in this line of work—certainly very different from the former occupation of subway guardianship!

Mr. Jones, highly myopic, with a detached retina of one eye that could not be successfully repaired, had been trucker for a fruit company. Following hospital care, it was necessary for him to resume support of his family, and a trucking job was forbidden because of the myopic condition and danger of retinal detachment in his one seeing eye. Through the co-operative efforts of several interested agencies he was put in charge of a newspaper stand and given supplementary financial aid until self-supporting.

Careful evaluation of each applicant's potentialities is essential, as is a farsighted point of view in helping to work out sound plans for the future. Another instance of detached retina of one eye comes to mind, when again operative procedure could not be successful. The sighted eye with correction had 20/40 vision, but, being highly myopic, the danger of detachment made re-employment as a laborer inadvisable and in this man's trade as an iron worker there was no opportunity for placing him. Through joint action, arrangements were made for him to secure six months' training in poultry raising at the Institute of Applied Agriculture, with a good prospect of placement in this line of work.

A fifteen-year-old boy of German parentage had been without usable vision since the age of nine, at which time his education in a parochial school had ceased; now hospital diagnosis showed a degenerated left eye and complicated cataract on the right. The left eye was removed and prolonged care with several operations secured 20/40 vision in the other; but at nineteen, with his very inadequate schooling and preparation, the outlook for this boy's future was gloomy, to say the least. Much had to be done with the family and with the boy himself in creating first a faith in medical treatment and later a realization that useful vision had been restored. The process of stimulating interest in vocational planning was more difficult still, especially as this entailed a readjustment of the whole family because of financial strain. The final solution, brought about through a development of trust and co-operative handling of the situation, was the rental of a cheap, dilapidated farm. Here the family of four, with the additional help

of a son working in the South, set about reconditioning and building up a vegetable and poultry market, with the boy, Eric, happy and actively at work on the farm. Instructive material obtained from the United States Department of Agriculture has served as guide in this apparently successful venture.

In the material that I have had opportunity to consult recently, many similarly nice placements are noted, with excellent adjustments to change in occupation and environment. Those of us in touch with the needs of the visually handicapped are well aware, however, of failures, of repeated discouragement, of inability to connect those two entities—the one who has something to offer, and the one who needs his services. But never let us fall into the error of thinking that there is no useful niche for the one with impaired vision. In vocational guidance there must be emphasis on assets rather than on liabilities. The visually handicapped must be thought of as potential contributors to the world—economically, socially, and, in fact, educationally, for it is through them that we can learn man's ability to overcome obstacles, to adventure into new ways, to meet cheerfully such trials and difficulties as will come.

You see from this discussion that I have drawn on the experience of rehabilitation and employment service, hospital social service, occupational therapy, work for the blind, industry, education and vocational training. It is upon the contribution of such varied factors that progress in this field must depend, for as has been indicated, it is only through close interplay and mutual understanding of these factors that success can be achieved.

The Cross-Eyed Child *

Brittain F. Payne, M.D.

FOR the proper correction of cross-eyes, the efforts of the oculist, general practitioner, parent and teacher are required to get the necessary co-operation of the child

THE cross-eyed child presents a great problem—great in the sense that he worries his parents, the family doctor and the eye-physician and, most of all, himself. The care and guidance of such a child is vitally important. He is not a cripple but is regarded as such by his playmates. Thoughtless remarks from children of his own age arouse a defensive attitude. He becomes sensitive to such names as "cock-eye" and "wall-eye." Whether he will become reserved, morose or pugnacious depends upon the treatment he is given. It is possible to develop normal individuals from cross-eyed children and this is being done today by means of careful medical supervision. Most eye hospitals, clinics and eye-physicians devote great effort to the treatment of this defect.

Eye-physicians appreciate the psychological, as well as the physical side of the cross-eyed child's problem. Various methods and many devices are used for the treatment of cross-eyes. Some of these instruments are useful, but no treatment should be undertaken until the underlying cause is determined. This should be done by a physician who has had special eye training. The reason why a physician should determine the cause of cross eyes is that he understands the entire body and knows the close relationship of the eyes to other organs. Cross-eyes may be the result of an accident before or during birth, or it may follow a disease of early childhood. The experienced physician would recognize these causes immediately. Parents should realize this and save themselves much anxiety and valuable time in the treatment of their children by consulting an eye-physician.

* Radio address delivered over WOR, through the co-operation of the New York Tuberculosis and Health Association.

Types of Cross-Eyes

Cross-eyes may be classified into several different types. There is a type in which the eyes may appear straight, but become crossed when the child is excited or fatigued. Another type may show no apparent crossing but merely a tendency which later develops into an actuality. These are the ones which may be helped by properly fitted glasses and certain exercises. Other types may show a definite turning of one of the eyes. It may turn in or out, or it may turn up or down. The eye which does not cross is called the good eye, the fixing eye or the master eye, and is always used to focus objects. The eye which turns is seldom used as much as the other and, therefore, its visual power is diminished. There is a type of cross-eye in which the vision is equally good in both eyes and either eye may be used as the master eye. The child simply uses the eye that fixes the object first and disregards the image in the eye that turns. The medical term for this condition is alternating squint. It is often difficult to treat this type with exercises but they should be tried in every case. Glasses may help any type of squint.

A convenient classification of cross-eyes has been made by Doctor Pugh of the Royal London Ophthalmic Hospital in which squint or cross-eyes are divided into the following groups: (1) Physical-defect group; (2) Error of refraction group, which includes those needing glasses; (3) Fusion-defect group, including those who fail to use both eyes together; and (4) Psychological group.

Physical Defect Group.—The physical defect group applies to eyes in which some disease has destroyed the back of the eye, or caused cataracts or scars to form which interfere with vision. It also applies to developmental defects and to hereditary tendencies. Some children fail to develop useful vision in one eye without apparent cause. The eye turns in or out, up or down, and sometimes an operation is required to straighten it.

Error of Refraction Group.—The error of refraction group refers to children who may be helped by wearing proper glasses. Frequently, they are cured by wearing glasses alone. In other cases, exercises and glasses may effect cure. This group offers the most hope for successful treatment without an operation. About 50 per cent of all cross-eyed children may be included in this group. Parents often ask how early glasses should be given to a child. They

may be worn successfully from the age of one year and in some cases earlier than that. We have seen many cross-eyed children helped before the age of two by means of properly adjusted glasses. Children often like them so well that they cry when they are removed at bed-time. The glasses should be prescribed by an eye-physician after the instillation of drops to dilate the pupil. The use of drops is necessary to determine the correct glass. We have never seen any harmful effects from the use of drops in the eyes of children. An accurate determination of the true measurement of the eye is impossible unless the pupil is dilated by means of drops.

Fusion-Defect Group.—The fusion-defect group includes children in whom the ability to make a single image out of the two visual impressions received by the brain, is defective or lost entirely. Glasses and exercises may not help them. However, they should be given a trial, and sometimes, a patch worn over the good eye stimulates and forces the use of the weaker eye. When the vision in the poor eye improves, it is possible that the two eyes may work together. This group includes about 20 per cent of all children with cross-eyes. It is important to recognize this type early and to institute proper treatment if an operation is to be avoided.

Psychological Group.—According to Dr. Pugh, the psychological group includes approximately 20 per cent of all squints. This condition usually occurs much later than the other groups. It may be imitative, for a history of imitating a parent or envied person is often given. School children frequently cross their eyes for the fun of it. Occasionally, the arrival of a new baby in the home will cause an older child to develop squint, which is done to regain lost attention. Others may develop crossed eyes after a fright. Training left-handed children to be right-handed is said to cause a turn of the eye. The treatment of this group is concerned with psychological measures and exercises as an adjunct. When readjustment occurs the eyes become straight. It would be unwise to operate until all other measures have failed.

Paralytic Type of Cross-Eyes.—An important class which has not been mentioned is the paralytic type of cross-eyes. In fractures and injuries to the head, the nerves to the eye muscles are often injured. The affected eye may turn away from its normal position. The patient will complain of double vision, which persists until he

recovers. In some cases, recovery takes a year or more. Others may retain double vision for a few years and may have to be corrected surgically. Double vision may occur in sleeping sickness. It may occur from injuries before and during birth. When eye muscles are paralyzed and the patient complains of double vision, we often cover the affected eye until it improves. Every effort is made to effect a cure without surgery, and at least from 12 to 18 months are allowed to pass before an operation is considered.

Many people are not actually cross-eyed but reveal a strong tendency to cross their eyes. We speak of this condition as "muscular imbalance." This condition is a serious handicap to aviators, automobile drivers, pilots and locomotive engineers. Persons so affected suffer from eyestrain, headaches and inability to judge distances. This condition is found in children and may not be determined until they are given a complete examination by an eye-physician. It often explains the lack of concentration in school children and, if not corrected, may develop into actual cross-eyes. It may be corrected by proper glasses, eye exercises, and the use of a prism in the patient's lenses. This tendency toward cross-eyes may be helped to such an extent by exercises that glasses may be unnecessary. It is the ambition of eye physicians to discontinue the use of glasses where possible, but in some cases they are needed and should be worn.

Regular Eye Examination of Children

We have considered all of the principal types of cross-eyes but we have said little about the regular examination of the eyes of children. Most authorities agree that all children should be examined by a competent eye physician before the school age. Valuable facts are often discovered which may influence the progress of the child in school. A child with granulated eyelids or cross-eyes is not expected to advance as rapidly as one with normal eyes. The examination consists of:

1. An accurate determination of the vision in each eye separately and together.

2. Examination of the eye muscles to see that cross-eyes or a tendency to cross-eyes are not present.

3. External examination of the eyes to rule out granulated eye-

lids, scars on the window of the eye and defects within the eye which might interfere with vision.

4. Testing for glasses by means of drops which dilate the pupil and give accurate estimation of the refraction.

5. Examination of the interior of the eye, with the pupils dilated, to see that the optic nerve and seeing layers of the eye are normal.

Such an examination may demonstrate the crossing of an eye or some other equally important condition. It often happens that parents have no suspicion of anything wrong until their child is tested carefully. From the examination, the doctor is able to classify the type of cross-eye and determine the treatment on a logical basis.

Why Treat Cross-Eyes?

The primary object in the treatment of squint or cross-eyes is to make the two eyes work together as a single unit. Normal individuals are able to compose the separate images of the two eyes into a single mental picture. They are able to appreciate distance and depth. The cross-eyed person cannot fuse the two mental images and has poor judgment of distance. He may have double vision. A child usually develops the faculty of fusing the two images fairly early in life. Most authorities agree that fusion develops before the age of 6 or 7 and rarely after that age. It is often defective if developed later in life. A test for fusion should be included in the first examination of the child, which should be performed before the age of 5 or 6.

No two cases of cross-eyes are alike in all their details. Each should be considered as an individual case and treatment should vary according to the particular case. In some instances, it is wise to straighten the eyes by means of surgery at an early date. In others, if an operation is indicated, it is wise to wait until after the age of 7. Surgery is never considered until every effort is made to correct the squint by glasses, exercises or other treatment. If glasses are needed, they should be tried for several months. Exercises should be prescribed and a patch worn over one eye if necessary. If all nonsurgical treatment is exhausted and it becomes necessary to operate, the parents should select an eye-physician who has had adequate experience in eye surgery. The operation

itself is not a dangerous one but requires considerable skill. It is confined to the muscles outside of the eyeball. Small children usually require general anesthesia but we have operated on some as young as 5 and 6 under local anesthesia. It is much better to operate under local anesthesia, whenever possible. Operations to straighten cross-eyes are almost always successful.

Conclusion

Cross-eyes often may be cured if the condition is recognized early and proper treatment is prescribed. The advice of a trained eye-physician should be considered and followed. The co-operation of parents and the general physician is needed. The confidence and enthusiasm of the affected child should be developed. If the child is within the school age, he should have the co-operation of his teacher. But, above all, there must be a willingness on the part of the child and his guardians to co-operate completely if anything is to be accomplished.

Conserving the Vision of Deaf and Hard-of-Hearing Children*

Mary May Wyman

THE author points out the precautions necessary for the conservation of vision of those children handicapped by deafness or hardness of hearing

CONSERVATION of the vision of every child in our schools is the solemn duty of each administrator as well as each teacher. If the State can make laws to demand that every child between certain ages attend school, the parents of the children and society in general are justified in insisting that the schools must use every reasonable effort to see that no harm befalls the child while he is at school. Surely vision is one of the child's most important, most precious possessions.

The advantages of protected vision should extend to all children enrolled in the school system. Those who are handicapped by poor vision are in need of certain types of protection, but the fundamental principles should apply to the normally sighted child as well as to the visually handicapped. Those who are charged with the responsibility of providing for sight-saving classes can contribute many ideas that are applicable to the larger group. In like manner, the school administrator must be willing to accept the basic principles that are worked out by this group of specialists.

Health has been listed as the first objective of education, yet frequently it is neglected entirely in the procedures of the classroom. More often eye health is not only neglected, but is outraged by unnecessary practices on the part of administrators and teachers.

Surely special attention must be paid to the vision of those children who possess the handicap of deafness. When one considers

* Presented at the meeting of the Progressive Oral Advocates, St. Louis, Mo., June 13, 1936.

that deaf and hard-of-hearing children literally hear through their eyes and that their eyes must do double duty throughout life, there is no need to argue that these eyes should be protected. Moreover, deaf children are always under a nervous strain. Eye strain and fatigue add to the nervous strain and the effects are cumulative. Teachers of deaf children, then, must exercise more precaution to protect the vision of their charges than the teachers of the normally hearing children. Let us group the factors that affect vision in two groups—first, those beyond the control of the teachers, namely, those that must be arranged by administrators, architects, business directors, supervisors or principals, and second, those for which the classroom teacher is directly responsible.

Windows

In the first place, every classroom should be large and well lighted. There should be adequate window space to insure sufficient illumination for the close type of work done in the classroom. The best light in any room comes from the top of the window. The windows, therefore, should run as close to the ceiling as possible. Due care should be taken that the depth of the wall from the window to the floor is such that shadows are not drawn across the children's work. Window space should run close to the front of the room to insure adequate lighting of the blackboards. It has been found that unilateral lighting is best for classrooms. If possible, an eastern exposure should be avoided, because of the intense light from the sun during the morning hours. In schools where there is a long afternoon session, a direct western exposure should also be avoided. In some systems, western exposures are permissible since children do not remain at school for an afternoon session. In order to insure adequate lighting, the walls should be painted a light color. The ceiling should be very light in color—white with enough tint to break the glare. Light walls and ceilings reflect the light so that children receive its benefit. Woodwork may be painted or stained, but in any event the material used should not be glossy. A flat-coat varnish or paint should be used. To a child sitting in a desk, a spot of glare on the door frame may cause an appreciable amount of strain that is bound to result in irritation. Since classes for deaf children must be small, there is a tendency

to make classrooms especially designed for deaf children too small to permit any of the activities associated with progressive education or to permit sufficient freedom in changing positions for various types of activity. The room chosen, then, should be large, airy, and well lighted.

Luminaires

Provision should be made for artificial light to supplement daylight. Luminaires should be carefully placed so that there will be an even distribution of light. Each should be equipped with a shade that will diffuse the light. Each shade should be large enough to permit lamps of sufficient wattage, and each should be simple in design and kept clean. The artificial light plus the daylight should give at least 20 footcandles of light on the working surfaces even on dark days. Illumination beyond 20 foot-candles is desirable. Many teachers think that sufficient lighting will cause strain, because they confuse light and glare.

Every teacher of deaf children should have access to a sight or light meter. At a maximum, these devices cost only $25.00. Good ones are obtainable now at half of this figure. Light can be easily measured by means of this device.

Window Shades

Window shades should be light in color. They should be translucent so that the light is diffused. Many window shades are so heavy that light is excluded when they are are drawn. Since the best light comes from the top of the window, window shades should be mounted in the middle of the window frame. There should be two shades to each window, the upper one to roll upward and the other to roll downward. The space between rolls should be protected by a shield to prevent the light from entering. The newest shields are of metal made in the shape of a horizontal V. Window shades should be free from cracks and pin holes, and wide enough to prevent streaks of light from entering at the sides. The furniture in the room should be movable, adjustable to the children's size, and finished with dull-coat varnish. Cabinets, tables, et cetera, should be likewise finished so that there will be no shine.

Books and Materials

Books and materials supplied should be selected with care so that there is no danger to the eyes from their use. Soft chalk is the correct type. Sight conservationists recommend a light yellow chalk, since yellow is more easily seen on the blackboards which are slate gray rather than black. For little children, this chalk should be supplied in large sticks one inch in diameter. For older children, where much writing is done on the board, I see no reason why the smaller size, soft chalk should not be used.

In brief, care should be taken that the classroom used by deaf children should meet the standards set for sight-saving classes. Ohio is an example of a state that makes this provision for its deaf children.

Teachers are not directly responsible for any of the foregoing. Quite frequently, however, teachers are consulted, or are permitted to make suggestions about the material to be used in their rooms.

Furniture

There are many factors in classroom management that are directly within the control of the teacher. No matter how perfect the equipment, the careless teacher may permit injury to the eyes of the children. Probably the greatest sin committed by teachers is that of the arrangement of desks. Movable furniture has many disadvantages when the teacher has queer notions. Somehow, the idea has reached teachers that if the children are seated in a semicircle, a circle, or a hollow square, the situation is a social one. Some teachers insist that there can be no social situation if children are arranged in rows. Light for work should come from above the left shoulder, so that the shadow is thrown beyond the hand. If the child is reading and is holding his book up, it is permissible to have the light come from the child's back. When children are arranged in three sides of a hollow square, one third of the children sit facing the light, the children at one end of one line receive adequate light which may or may not be from the left side, and the other third sit with their backs directly in the light. As a consequence of this arrangement, about ten per cent of the children, probably less, receive adequate light for their work. A circle or a

semicircle contains much the same disadvantage. The social atmosphere in school is created by the teacher and her attitude toward the children as individuals in a class.

Teachers have a habit, moreover, of using the light side of the room for work that requires little vision. The results of industrial activities, flower stands, the teacher's desk, et cetera, are frequently placed on the light side of the room, while the children work at their desks far away from the windows. With as few children as are usually found in deaf classes, it should be possible to have them move their positions in the room, so that adequate light is provided at all times. The sight meter should be kept in use. Even small children can be taught to arrange conditions for themselves, so that adequate lighting is procured. To learn how to arrange good working conditions is part of the child's education. It has been suggested that boards of education could save large sums of money if they failed to buy teachers' desks. This saving could be made without loss to anyone, since the teacher has no time to sit at her desk. Of course, this is a radical viewpoint. The teacher's desk, however, should be put at the position in the room where the lighting is the poorest. When the teacher does desk work, it is usually in the afternoon after the children have gone. She can then move her work so that her lighting will be sufficient for the work she has to do. The library table has been accepted as a very desirable part of the classroom equipment. Again, great care must be taken to see that the children do not face the light. Quite frequently, although the library table is used for a very small portion of the time, it is given the best position in the room. Many teachers solve this difficulty by having the library table in a place where the books are kept invitingly available and where the lighting is as good as can be secured without monopolizing the best position. Children then go to the table, select their book, and return to their seats for reading.

The small size of the class for deaf children should make it possible for different types of work to be done in different parts of the room. Writing should be done with the light coming over the left shoulder. Exercises in lip reading should be given where the light will fall on the face of those whose lips are to be read. When children are to work from the blackboard, they should be seated di-

rectly in front of the board, close enough to see, but far enough away to avoid the strain of looking up.

A very few rooms in this county are equipped with an electric eye so that lights are automatically lighted when daylight falls below a given number of foot-candles. In the majority of instances the teacher of deaf children must be cognizant of the need for regulating window shades. Some teachers believe that shades must be drawn to precisely the same level. Shades, however, are designed for use. If it is necessary to have one shade down to diffuse the bright sunlight streaming in one window, it should be so arranged.

Curtains

In this same category comes the idea that sash curtains give the schoolroom a homelike atmosphere. One sees curtains made of every conceivable material, from sheer white to heavy, checked gingham and crêpe paper; curtains that cover the lower sash; curtains that are mere ruffles across the window's middle; curtains that are clean, and curtains black with the grime of the city. At best, these curtains cut off the light. If they flutter in the breeze, there are flickering shadows that interfere with somebody's work. Atmosphere is created by the teacher's and children's attitudes. It is largely a reflection of the teacher's point of view.

There is also the "artistic" teacher who believes that pictures look well on the windows. She either pastes her cut-out designs on the panes of glass, or she uses show cards to paint the pictures there. The architects who do try to give adequate lighting have every right to be indignant when teachers cut off the light supply in this fashion.

Then there are plants. It is highly desirable that children have the opportunity to learn to love growing plants. The schoolroom windows, however, should not be overburdened with large pots or boxes of flowers that diminish the amount of available light—especially when it is already cut by the smoke of the city.

Pictures

Another common error is that of hanging large areas of glass-covered pictures where they will create a glare. The teacher does

not have to sit in a seat and look up; consequently, she is not aware of the irritation. While there is a tendency for all teachers to use pictures, the teacher of deaf children uses more pictures than anyone else. The teacher of our deaf children needs, then, to be very careful in her choice of pictures.

It is unfair to expect children to see pictures at a distance of five or more feet that the teacher must hold closely to see. Colored pictures have many advantages over those that are not colored. Mere color, however, does not guarantee that the picture is readily visible. For that reason, sight-saving teachers outline with a firm line of India ink the part of the picture they wish seen. If the pictures are clear, the child is confronted with enough problems —reading the lips, associating ideas, et cetera. During lessons of this type the teacher must be very careful to place pictures on the level of the child's vision. To have a row of pictures mounted at the top of the blackboard and expect children to watch the teacher's lips, then crane their necks to see the pictures and finally to point high above their heads, is expecting the impossible. The teacher of the deaf, therefore, should select her pictures carefully, make them easily visible, and so arrange them that the child can see them.

Finally, teachers of deaf children must avoid cluttering the room with too many pictures at one time. A well selected poster will teach the desired lesson. That one should be left up for a few days and replaced by another. A large array of posters, magazine cut-outs, et cetera, on display all during the day serve only to confuse the child.

Glasses

This paper would have to be many times this length to cover all the points that should be mentioned. No attempt has been made to point out that the eyes of deaf children should be examined by the best available skill to determine if there are defects that can be remedied by glasses. Here, too, the teacher can lend her influence.

In conclusion, the vision of children who are being subjected to the eye strain of reading lips should be safeguarded. Room equipment should be similar to that provided for sight-saving classes.

While the large type books and materials used by sight-saving classes are not necessary for most deaf children, the teacher should constantly evaluate material in terms of eye strain. The teacher must be vision-conscious if deaf children are to be spared the additional handicap of impaired vision.

Education for the Visually Handicapped*

Christine P. Ingram

PRESENTING the aims, purposes, equipment and standards for a sight-saving class, the author describes some specific experiences in the Rochester, New York, classes of which she is the supervisor

EDUCATION for the visually handicapped, as we know it today, is relatively a new child in the field of education when one realizes that in 1913, less than 25 years ago, the first sight-saving class for partially sighted children in this country was opened in Boston in April, and that Cleveland, Ohio, now recognized as one of the outstanding centers for education of the visually handicapped, opened its first class in September of that same year. Five years previously, in 1908, England had opened her first special school for the partially sighted.

Previous to these inceptions, the education of this group was not treated as a special problem. They received their instruction in schools for the blind by the same methods that were applied to the blind, or they struggled in the regular grades with normally sighted children.

The need for and value of the sight-saving class are being increasingly recognized so that each year has shown a steady increase in the number of classes established throughout the country. In the White House Conference Report of 1930 on Child Welfare, one reads that there were 350 such classes in 93 cities and two counties, representing 21 states. Ohio, Michigan, and New York States have made the most adequate provision. The annual reports of the National Society for the Prevention of Blindness indicate additional new classes each year, despite general educational curtailments. The 1935 annual report indicated that the total number of

*Presented at the Institute on Conservation of Vision, Rochester, N. Y., October 15, 1935; arranged by the Bureau of Prevention of Blindness of the Division for the Blind, State Department of Social Welfare.

classes in the United States had grown to 478. This includes the District of Columbia and Hawaii.

Who Shall Go to Sight-Saving Class?

Who are the pupils for whom such special educational provision in the day schools seems advisable? They are those children who on account of defective vision cannot follow the ordinary school program, but can be taught by special methods involving the use of sight, and those who are suffering from conditions such as high myopia which may be affected by following the ordinary school program.

The following quotations are taken from the University of The State of New York *Bulletin* No. 994 on sight-saving classes:

> A New York State Law provides that "in any community where there are ten or more children with such seriously defective vision that they are educationally handicapped, it is mandatory that the board of education establish a sight-saving class to meet their needs. To encourage the organization of such classes the law provides that a full elementary teacher's equivalent be allowed for each special teacher."

Determining the children who are eligible to instruction in such a class, the same *Bulletin* states:

> "The eligibility of children to sight-saving classes depends to a great extent upon the consideration of individual cases, but the following four types make education in the regular grades practically impossible:
>
> "1. Children having more than 20/200 vision but not possessed of sufficient visual acuity to enable them to read ordinary print or to see letters and figures on the blackboard;
>
> "2. Children with progressive eye difficulties;
>
> "3. Children with diseases of the eye that seriously affect their vision;
>
> "4. Children who are able to read ordinary print but only at the expense of their vision.
>
> "The question may arise as to what specific types of cases may serve as a guide for class selection. If so, the following may serve the purpose:
>
> "1. Children who cannot read more than 20/70 in the better eye with correction;

"2. Children who have progressive myopia, even though glasses may bring the vision up to nearly normal;

"3. Children suffering from eye diseases in which some irritation may be present, provided the approval of the attending physician is given;

"4. Any child, who, in the opinion of the ophthalmologist, would benefit by assignment to a sight-saving class, subject to the acceptance of the educational authorities having charge of such classes."

The learning abilities of children in the sight-saving class represent a cross section of the learning abilities of school children in general. Children assigned to such classes may be expected with the special equipment and program provided to make average school progress or better year by year, as do the majority of children in the grades. There may be a few children in the sight-saving class, just as in any grade, who learn more slowly but who can, given sufficient time, master the minimum grade course. The mentally retarded child who has seriously defective vision is placed in a special class for the mentally retarded, and his eye work is planned accordingly.

The number of children enrolled in a class may range from ten to sixteen or eighteen, depending on the age and grade range. As each pupil must be planned for individually, the numbers are of necessity smaller than in the grades.

What Are the Aims of the Sight-Saving Class?

As we recognize the fundamental premise of education for all children, whether handicapped, normal, or gifted, to be the development of the individual to the fullest of his capacity to enjoy, to share in, and to contribute to the worthwhile activities of life, the purposes and values of the sight-saving class come to be realized toward the same end.

Dr. Elise Martens, Senior Specialist in the education of the handicapped in the Office of Education at Washington, states this fundamental principle as follows:*

* Ingram, Christine P.: *Education of The Slow-Learning Child,* World Book Co., 1935, p. ix.

> "Each child shall be educated in keeping with his capacities, limitations, and interests, looking toward the happiest adjustment he can make in life and the most constructive contribution he can bring to society."

Our purpose, then, in the sight-saving class is to understand the individual child, his capacities and his limitations, and to provide the best school environment possible for his all-round development. I shall be more specific as to our purposes and aims when I discuss our Rochester classes.

Community Responsibility for Sight-Saving Class Children

How is our own community meeting the need of the partially sighted child? In 1918 the first class was established in Rochester. Today we have three classes at the Alexander Hamilton School No. 31, with an enrollment of 35 children.

There is a primary class—grades 1 to 3—consisting of 12 pupils; an intermediate class of 12 pupils—grades 4 and 5; and an advanced class of 11 pupils—grades 6, 7, and 8.

There are also enrolled in high schools, eight children who have graduated from the advanced class of School No. 31. For them special programs to minimize eyestrain are arranged and some plan is made for reading orally some of their work to them.

There are four children in the grades whose parents are unwilling for the transfer or consider the distance a factor. There are three five-year-old children in the kindergarten whose teachers and parents have been advised as to special eye care, and who at six years of age will enter the sight-saving class. The total number of sight-saving children, therefore, known in Rochester is 50.

We could care for 12 more children in our present set-up of three classes at School No. 31 and additional state aid for a fourth class might be secured if Rochester has such a need.

The children in need of sight-saving classes represent only a very small percentage of the school population. It is estimated that 0.2 per cent of the school population, or one in every 500, is in need of a special program for his sight. A conservative estimate is one in every 1000. In Ohio, communities that are serving such needs through the sight-saving class, one in about every 650 in the school population is enrolled in a sight-saving class.

On the basis of the school population in Rochester, 49,500 in public elementary and junior and senior high schools, and 17,100 in parochial schools, on a basis of one in every 500, there is an estimated number of 132 sight-saving class pupils; on the basis of one in every 1000, an estimated number of 66. If we accept the latter conservative estimate, Rochester falls short of the number by about 15. Pupils from surrounding towns may be accepted in the Rochester classes and tuition can be taken care of through state aid and petition.

One of our practicing oculists in Rochester has generously given his time for several years to pass on candidates.

Our selection of cases in Rochester is conservative. Whereas each case is an individual problem, a child is not often placed whose vision with correction in the better eye is better than 20/70. We have a much smaller percentage of myopes in our classes than Cleveland. Rochester has 16 per cent; Cleveland has had 37 to 52 per cent over a period of ten years; Baltimore in a recent report showed 44 per cent. I might say, in passing, that a large percentage of England's sight-saving classes are for myopes. Their first sight-saving class was made up wholly of myopes.

In a report in June, 1934, Mr. Lewis H. Carris of the National Society for the Prevention of Blindness suggests certain types of cases that might be referred to the sight-saving class temporarily for physical and mental adjustment. These are the children whose handicap does not require the special program but about whose need for adjustments we should be thinking: the one-eyed child who has just had an enucleation; the cross-eyed child, and children with certain diseased conditions for which eye care is advisable.

It may be that the borderline child in the grade, including the myopes, needs some supervision in his grade work and careful medical follow-up in order that he may work as efficiently and with as little strain as possible. Our regular grade teachers need a background of eye anatomy and eye hygiene. We are glad to note that there is increasing interest on the part of the grade teacher in the physical problems of the individual child, and as time goes on we may look forward to increased understanding and more consideration for eye problems in the regular classroom.

Purposes of the Sight-Saving Class

The following purposes and values are considered for our sight-saving class program in Rochester:

1. To enable the child to adjust as normally as possible to his environment at the present time and to grow increasingly in adjusting so that his education may be a plan which aids toward ultimate adjustment in home, community, and industry.
2. To enable the child to have as normal a school experience as possible in a school with sighted children.
3. To teach sighted children to respect the handicapped child and to appreciate the place he is able to take in his school, home, and community groups.
4. To enable the child to use his limited sight with maximum efficiency and minimum strain.
5. To enable the child to face his handicap and to develop his abilities to the utmost—to enable him to make normal grade progress.
6. To develop healthy personalities—courage, self-confidence, independence, self-reliance, tolerance, and good humor.
7. To aid in seeing that the general physical well-being of the child is attended to and that necessary medical treatment is carried out.
8. To secure the home's co-operation in the building of desirable eye hygiene and health habits.
9. To aid the child to adjust sufficiently well to enter an adjusted high school program or to get and maintain a job.

In order to better carry out our purposes, studies of the physical well-being of the children are being made by the classroom teacher, health teacher, and school nurse. Studies of social and emotional well-being will follow.

Special Equipment for Sight-Saving Class

Our sight-saving classrooms are located with an eastern exposure, walls are painted light buff and ceiling a light cream. They are fitted with higher watt bulbs than the regular grade room, and one room has been fitted with a photo-electric cell which controls the lighting. The cell is located in the darkest corner and may be set for a certain amount of candlelight power. If the

amount of light is less or greater, the lights are automatically turned on and off.

The pupils' desks are adjustable and movable. Large clear-type books, large outlined maps, unglazed buff paper, large pencils, and heavy soft crayons are some of the children's tools. Bulletin size typewriters are provided on which the intermediate and advanced pupils may prepare their work, thereby relieving eyestrain.

In this brief report there is not time to tell you of the home visits, of teacher-parent contacts, and of the problems of educational, recreational, and vocational guidance.

As we look toward the future in Rochester, those of us who are engaged in sight-saving class work desire to strive toward the following goals:

1. To take care in sight-saving classes of all the children of school age in our community who need such special eye care.
2. To assist the grade teacher in making adjustments for the borderline case with a less serious vision handicap.
3. To keep abreast of new developments, to challenge our sight-saving class program, and to make any necessary changes and improvements.
4. To develop a better knowledge of the place these pupils may have in industry and to plan co-operatively with the family and the Rehabilitation Bureau for the individual pupil when he leaves school.
5. To develop a better understanding and appreciation of the social adjustments these pupils must make, of what their leisure time activities may be, and of the possibilities for placing them in contact with normal group activities.
6. To encourage and promote eye hygiene and preventive measures which will, in time, reduce the number of eye conditions and diseases which today require remedial and special educational attention.

With an awareness of the needs that these goals imply, the school welcomes the counsel and co-operation of any agency or any individual in the community who can help it to see its job more clearly and to carry that job out more effectively.

Safeguarding the Eyes of Children

A Pictorial Review

THE SIGHT-SAVING REVIEW presents in pictorial form one of the many aspects of sight conservation. Subsequent issues will contain other topics in illustrated form. The National Society for the Prevention of Blindness offers, for loan, slides and photographs on these subjects.

Photo by Doris Day

Safe and sound

Courtesy of the Cottage School, Riverdale, New York City

Safe play under adult supervision

At Play

Scissors
are dangerous
playthings

Fireworks are not safe for children

On July Fourth

Bang!
Will another
eye be lost?

Proper reading posture

At Home

Wrong reading position

Courtesy Eastman Teaching Films

Uncontrolled direct sunlight
causes eye distress

At School

Properly supplementing daylight with
artificial light relieves glare

Courtesy General Electric

Courtesy Commonwealth Edison Company

Good set-up for a sight-saving class

In Sight-Saving Class

Correct desk and posture

Note and Comment

Plans for National Society Annual Conference.—Columbus, Ohio, will be the scene of the Annual Conference of the National Society for the Prevention of Blindness, December 3, 4 and 5. Ohio agencies are assisting in planning the program and are making available their facilities to visiting delegates.

Thus far the following topics have been designated for the program: Eye Hazards in Industrial Occupations; Eye Health in Relation to Social Work; Eye Health Problems of College Students; The Nurse's Approach to Eye Health; Responsibilities of Teacher Training Institutions for Eye Health; and Sight-Saving Classes.

A forum meeting will present the subject of Rehabilitation versus Relief, and a dinner meeting in co-operation with the Columbus Academy of Medicine is planned.

Exhibits, motion pictures and slides will be presented during the Conference, and opportunities for personal interviews with members of the staff will be afforded. Copies of the complete program will be available upon request after November 15.

Conjunctivitis Can Be Prevented.—Speaking before the General Assembly of the International Association for the Prevention of Blindness and of the International Organization against Trachoma last spring, N. Bishop Harman, ophthalmic surgeon, presented the subject of conjunctivitis in children. He corroborated the opinion of many public health and ophthalmic physicians that conjunctivitis occurs more frequently among the poor and over-crowded than among the economically secure; that it occurs more frequently in the dry, sunny months from April through June than at any other time; that it is more frequent in childhood than youth, in youth than in age, and finally that it is more frequent among females than males. Harmon based his findings upon three sources of evidence: (1) a large ophthalmic hospital; (2) a children's hospital; and (3) London elementary schools. He expressed his conviction that conjunctivitis, even in the most chronic form

of trachoma, can be controlled, and that such control is practical. He cited as an example of prevention and treatment the experience of the Labour Corps in France during the Great War. "Trachoma was rife amongst the coolies. The steps taken to remedy matters were three: (1) instructions were given that no labourers with trachoma should be recruited from abroad; (2) affected men were segregated; (3) treatment was given both to the affected and the 'clean.' The latter received zinc drops and their towels were sterilized regularly. By these means the disease was held in check, and it did not spread to the French population or the British troops."

Vision Testing Among School Children in Japan.—The regular correspondent of the American Medical Association in Japan presented the following interesting note in a recent issue of the *Journal of the A. M. A.* on the findings of vision testing among school children in Tokyo: "Not until 1932 did the Tokyo municipal officials, for the first time, undertake to investigate the vision of school children. In the following year the first eyesight class was attached to a certain primary school on a small scale. The so-called poor vision in this country means vision that cannot be improved by any glasses. The Ophthalmic Association of Japan has defined it as follows: Children with poor vision of low degree are those who cannot see clearly even with the aid of glasses, the 0.3 in the international vision test chart, while children with a higher degree are those who can barely discern figures 1 meter distant. They are divided into two classes, A and B. Class A contains those who, with glasses, cannot clearly see the 0.3 in the international chart and can discern figures 2 meters distant. Class B. includes those who, with the aid of glasses, cannot discern figures 2 meters distant. The Education Office ordered the local government to examine the vision of school children throughout the country last year. Among 3,740,215 boys and 3,625,813 girls examined, they found 4,797 boys (1.25 per thousand) and 5,237 girls (1.44 per thousand) with poor vision. These figures contain 4,258 boys of class A and 4,765 girls of class B. The number of children who were allowed to postpone entering the primary school on account of poor vision was 114, 47 of whom were boys and 67

girls. The number with poor vision increases as the school year advances. There are, for instance, in the sixth year class, which is the highest grade in the first primary course, more than three times as many with poor vision as in the first year class. Generally speaking, there are more weak-sighted girls than boys. The causes of poor vision are, first, those of hereditary nature; then comes trachoma, then nearsightedness of high degree, and finally physical weakness. Several classes for poor children with defective vision are to be established in Tokyo and in other great cities in the near future."

Ophthalmological Research in U.S.S.R.—The recent report of the Second All Union Congress of Eye Physicians of Russia, held in Leningrad from June 25 to 29, indicates major scientific advances in Russia. According to Professor M. J. Auerbach, the number of eye physicians in Russia has been increased from a few hundred to 3,000 in the past ten years. Notable among the achievements of the ophthalmologists is the founding of the Central Institute of Clinical and Experimental Ophthalmology which co-ordinates and directs all the work in this field in Russia.

Is Corneal Grafting Practical?—According to Professor V. P. Filatov, Director of the Odessa Institute of Experimental Ophthalmology, it is possible to transplant corneas obtained from the eyes of living people for use in cases of blindness due to leucoma. In addition, it is possible to obtain good results by the use of eyes removed from corpses, not only immediately after death, but several hours later, provided the eyes intended for transplanting are kept in a cool temperature. In 95 attempts to transplant corneas from corpses, Professor Filatov has had 18 cases in which the cornea remained alive and transparent. Eleven of the 18 successful cases were lost track of after a year to two years and four months. Some of the patients had their sight restored sufficiently to be able to work.

Children's Fund of Michigan.—In pursuance of the purposes for which the Children's Fund of Michigan was organized, it has included in its activities the correction of visual defects and reports that such activity was continued as one of the efforts of the Fund

throughout the year. It maintains two traveling oculists who have examined the eyes and prescribed corrective glasses for more than 5,500 children in 12 counties and two of the district health units. Among the studies which are pursued under this fund is one on impaired vision of children and its relation to a Vitamin A deficient diet.

Massachusetts Approves Prophylaxis for Ophthalmia Neonatorum.—The following treatment of the eyes of infants at birth has been outlined by the Commissioner of Public Health of Massachusetts: "A one per cent filtered solution of silver nitrate, U.S.P., in distilled water, stored in ampules for single use, the ampules to be protected against penetration of light and provided that if the ampule must be broken, it shall not be made of glass or other shatterable material which might cause injury to the eye, and further provided that the ampule or its container shall bear an expiration date which shall not be later than six months after the date of preparation of the solution and that no solution shall be used after said date of expiration."

Under recent provisions no prophylactic for the treatment of the eyes of infants at birth may be used which is not furnished or approved by the Department of Public Health which recommends the following procedure:

1. Every pregnant woman concerning whom there is the least suspicion of gonococcal infection should be so treated for the infection, both during pregnancy and at delivery, that the birth canal may be as free as possible from the gonococcus during the birth of the baby.
2. The following order of procedure is recommended for the use of the prophylactic in the baby's eyes:
   a. Clean the skin of the four eyelids with cotton pledgets moistened in boric acid solution, using separate pledgets for each eye.
   b. Thoroughly irrigate the conjunctival sac of each eye with boric acid solution, using a sterile soft rubber ear syringe.
   c. Retract the eyelids, digitally, and instill one drop of a one per cent solution of silver nitrate into each eye, preferably near the outer canthus, and allow the solution to remain in contact with the conjunctiva for at least two minutes.

d. Irrigate the conjunctival sac of each eye with sterile normal salt solution to prevent chemical conjunctivitis.
e. Secure the services of an ophthalmologist upon the first appearance of suppurative conjunctivitis and insist upon a bacteriological report on the conjunctival secretions.

3. Precautions: Since corneal abrasions promote ulceration in the presence of the gonococcus, great care must be taken to avoid contact between the cornea and the finger manipulating the eyelids, the irrigating syringe or the eye-dropper, if the above recommended procedure is carried out.

Testing Lighting Systems before Installation.—A news item published in a recent edition of *Science Supplement* describes a model room for the accurate testing of lighting adequacy. This room is now available to architects or builders in the lighting laboratory of the University of Michigan. The apparatus which is the only one of its kind, according to Professor H. H. Higbie, of the department of electrical engineering, will make it possible for architects to see in advance how any lighting system will work. The item in *Science Supplement* says further: "By changing the ways in which light is admitted, and by varying the kinds of paint on the ceiling, floor and walls of the model room, any lighting conditions may be reproduced to solve specific problems of illumination. The accuracy of the apparatus is insured by a complete check before each test is made. Numerous tests in full-size rooms have verified the applicability of the data obtained with this device.

"A photo-electric cell, mounted on a carriage, moves back and forth, so that an accurate survey of the whole room may be made. The current generated in this 'electric eye' is amplified, then recorded by means of an oscillograph. A beam of light, developed in the oscillograph, falls on a moving strip of photographic paper, thus making a graphic record of the trip of the 'electric eye' about the room.

"If it were not for reflections, this complicated apparatus would be unnecessary, since illumination could be calculated by mathematical means. The troublesome reflection difficulty, however, is solved by covering the 'electric eye' with a diffusing glass, which catches light from all angles and transmits it to the photo-electric cell.

"Most of the present tests are conducted with the luminous panel type of lighting, which is now coming into vogue. Permitting almost unlimited variations, as well as efficient illumination, it may readily be incorporated into the decorative scheme."

Devices of Interest to Sight Savers.—*Popular Mechanics Magazine* for October describes several devices of special interest to anyone concerned with eye welfare. One is an antiblinding, nondazzling photo-flash lamp which eliminates eye shock incidental to the taking of pictures. It is described as follows: "The bulb of the lamp is coated with a lacquer colored with a blue dye which permits little glaring yellow light to come through when the lamp flashes. Although this coating reduces the amount of light given off by the lamp, it is said that sufficient blue, violet and ultraviolet light rays pass through to produce a good negative. The inventor claims that a person may be photographed with the new flash lamp without knowing his picture has been taken."

The other device is of special interest in the saving of eyes in industry. "To enforce a safety rule requiring machinists to wear goggles while at work," *Popular Mechanics Magazine* reports, "a Freeport, Ill., manufacturer devised a novel switch. When the goggles are not in use, they rest on a tray balanced above the plunger of a sensitive electric switch connected to the motor of the grinding machine. As long as the goggles are on the tray, their weight is sufficient to depress the plunger and cut off the grinder motor. The operator can not go to work until he picks up his goggles, allowing the circuit to be completed and starting the motor."

Union of Counties Associations for the Blind.—In accordance with two of the objects of the Union of Counties Associations for the Blind in England and Wales, namely, in every way to assist research into the welfare of the blind and into the causes and prevention of blindness, and to co-operate with organizations working for the blind and for the prevention of blindness throughout the world, the Annual Report for 1935–36 gives a résumé of the activities of the Prevention of Blindness Committee and also mentions the Report of the Committee of Enquiry into problems relating to Partially Sighted Children which was the subject of a Symposium

at the Annual Meeting in June, 1935. Tables of statistics supplied by the constituent Counties Associations and tables showing the totals for the whole country, as well as a map indicating the areas of the seven Counties Association, are bound up with the Report.

Change in Canib News Sheet.—A change of policy was announced by the Canadian National Institute for the Blind, in a recent issue of the *Canib News Sheet* as follows: "It was decided at the conference of Institute superintendents that much of the matter contained in the *News Sheet* must be of little interest to members of boards and committees and that the circulation of the publication should be largely confined to staff members. The size of the publication will also be considerably curtailed. To compensate those who might feel that they were being deprived of an avenue of information which kept them in touch with Institute activities, it was decided that those who are now on the mailing list of the *Canib News Sheet* and who are not staff members, would be transferred to the mailing list of *The National News of the Blind.* This quarterly, originally designed for circulation amongst blind people, contains news of direct interest to those without their sight and it was thought that the material contained in it would be of much more information to those interested in the welfare of the blind than the routine official news which occupied so much space in the *News Sheet.*"

Institute on Conservation of the Eyesight of School Children.—The Illinois Society for the Prevention of Blindness presented this Institute, which was endorsed by Dr. Frank J. Jirka, Director of Public Health, and John A. Wieland, Director of Public Instruction, on August 31, September 1, 2 and 3. The course was limited to sixty members, preference being given to registered public health nurses engaged in school work, and no charge was made.

One Hundred Third Annual Report.—Olin H. Burritt, Principal of the Pennsylvania Institution for the Instruction of the Blind, reports for 1934–1935 on the studies and many extra-curricula activities of the Institution's pupils, among whom is included one deaf-blind lad. "Every available place in the school is filled and there is a small waiting list."

Our Stone-Age Eyes.—The editorial page of the September issue of the *American Boy* is devoted to a series of short articles explaining why our eyes need more attention than those of the Stone-Age men. The printing press and the use of artificial light have caused many of our eye troubles and while we wouldn't be without either, the editor suggests that we insist on adequate lighting, especially for fine print, and tells of other ways in which we can help our eyes to meet the heavy demand made on them in the modern world.

Special Institutes for the Prevention of Blindness.—The Pennsylvania Association for the Blind, Inc., calls special attention in *The Seer* to the fact that Miss Evelyn M. Carpenter is now in charge of the Prevention of Blindness Department of the Association's Philadelphia Branch, with some 25 or 30 per cent of her time assigned to the Association at large for the conduct of special institutes and other professional activities incident to state-wide work for the prevention of blindness and conservation of vision.

Crossed Eyes Are Straightened.—Outstanding among the Lions Clubs which are doing such excellent work among children with defective vision is the Raleigh, N. C., club, which examined 88 children during the past year and provided 77 of them with glasses. Since 1927, when the club entered on this activity, Dr. G. C. Hodgens has examined the eyes of more than 300 children for the club.

National Society Notes.—Following his participation as lecturer in the various summer courses for the training of sight-saving class teachers and supervisors, Mr. Lewis H. Carris, managing director, spent some time in Columbus, Ohio, to discuss arrangements for the annual conference of the National Society, which will be held there on December 3, 4 and 5. He also attended the 1936 Conference of the Mobilization for Human Needs in Washington, D. C.

The summer course for the training of sight-saving class teachers and supervisors, given at Teachers College, Columbia University, and directed by Mrs. Winifred Hathaway, associate director, had an enrollment of 29 students.

Among the colleges recently requesting the services of Dr. Anette M. Phelan, staff associate in education, were the National College of Education in Evanston, Illinois, Syracuse University, and Teachers College, Columbia University. Dr. Phelan also visited the universities of Kentucky, Chicago, Minnesota, Illinois and Normal University in Normal, Illinois, throughout the summer months for conferences on various eye health problems.

Returning from her attendance at the Biennial Nursing Convention in California, Mrs. Francia Baird Crocker, associate for nursing activities, spent time in Oregon and Washington, presenting the subject of sight conservation before selected groups of public health nurses. Included in her program was a series of lectures at the University of Oregon, in Portland, as well as a series at the University of Washington, in Seattle. Individual lectures were presented also before the health officer and county nurses in Salem and Eugene, Oregon, respectively, and before the nurses of King County in Seattle, Washington.

Since the last issue of the Review was published the Society has sustained the loss of two of its most active members, Thomas Beaver Holloway, M.D., and John Lincoln Wilkie. At its meeting on the first day of October, 1936, the Executive Committee resolved to incorporate the following two statements in its minutes:

Thomas Beaver Holloway, M.D., 1872–1936

The Executive Committee of the National Society for the Prevention of Blindness records with sorrow the death of Dr. Thomas B. Holloway, one of the Society's valued friends and counselors. It was the good fortune of the Society to have had his services for six years on the Advisory Committee and for the past four years as a member of the Board of Directors. Dr. Holloway was distinguished not only for his professional achievements in ophthalmology, but also for his deep, active interest in the social movement for the prevention of blindness. Fortunately his teaching opportunities enabled him to impart this broader understanding of the implications of ophthalmology to the practitioners of the future. Merely to list the numerous institutions and professional societies that Dr. Holloway served in positions of responsibility would show the esteem in which he was held by his associates. Chairmanship of an ophthalmological committee appointed by the American Medical Association to co-operate with the National

Society was among these affiliations. In this capacity, Dr. Holloway frequently was instrumental in interpreting the Society's work to the medical profession. Once convinced of the worth of a project he was glad to put it to the test in his practice. When the newly formed Committee on Statistics of the Blind was in need of medical support, his prompt offer to make available for the Committee's first study, the records of the school for the blind for which he was examining ophthalmologist set an example that others were proud to follow. Professionally and personally, the death of Dr. Holloway will be keenly felt.

John Lincoln Wilkie, 1865–1936

From the early stages of the movement which became the National Society for the Prevention of Blindness, Mr. John L. Wilkie was associated with its growth and development. He was a member of the Committee on Prevention of Blindness of the New York Association for the Blind. When the National Committee for the Prevention of Blindness was established he was one of its charter members, was chosen a member of the Board of Directors, and became the organization's trusted adviser on all legal matters. In this capacity he rendered the Society most valuable service, and lent it distinction by his personal and professional connections.

Current Articles of Interest

The Conservation of Vision in the Child, George E. de Schweinitz, M.D., *Pennsylvania Medical Journal,* July, 1936, published monthly by The Medical Society of the State of Pennsylvania, Harrisburg, Pa. The author introduces his essay as one which "will concern itself briefly with various conditions which jeopardize the preservation of children's vision and with their prevention and treatment, with the detection and management of refractive errors in early life, with congenital amblyopia, and with certain ocular muscle anomalies and their consequences." He stresses the point that "successful conservation of vision in children's eyes depends upon the co-operation of the general physician, the pediatrician and the ophthalmologist, and in one highly important condition upon the co-operation of the obstetrician."

Operative Results in Cataracts Coincident with Dinitrophenol Therapy, Hans Barkan, M.D., W. E. Borley, M.D., Max Fine, M.D., and Jerome Bettman, M.D., *California and Western Medicine,* May, 1936, published monthly by the California Medical Association, San Francisco, Calif. "This paper describes the clinical appearance of some of these patients and the results of operations on twenty eyes operated upon for cataracts in this group," say the authors, and in conclusion remark that "the table as presented shows twenty eyes operated upon, but in the last two weeks three more patients with bilateral cataracts have appeared, and four more eyes than are shown in the table have been operated, all without complications. The results shown in the table, and in the additional cases just mentioned, justify a good prognosis as regards re-establishment of useful vision to those afflicted with cataract formation coincident with ingestion of dinitrophenol and loss of weight resulting therefrom."

Some Thoughts on Light and Architecture, Otto Teegen, *Transactions of the Illuminating Engineering Society,* May, 1936, published monthly by the Illuminating Engineering Society, New York, N. Y. The close relationship of architecture, light and color

is discussed. The author cites specific examples of lighting problems in connection with various pieces of modern architecture and concludes that "architecture depends on lighting as one of its principal functional and decorative features, while you (the illuminating engineer) depend on architecture as the source of development in lighting."

Methods of Measuring the Ability to Drive an Automobile, Alvhh R. Lauer, Bulletin 115 of the Engineering Extension Service, Iowa State College, Ames, Iowa. Dr. Lauer believes that a driver's license examination "should do for the driver, in a psychological way, what the medical examination does for a person in a physical way," that is, "should make known to him his condition at the time of the examination with a suggestion of ways and means for improving this condition," and concludes that "in the same way that medicine has increased the life span 25 or 30 years in one generation, the proper application and follow up of driver's examinations will reduce accidents by a considerable amount."

Cod Liver Oil as Local Treatment for External Affections of the Eyes, Edgar Stevenson, *British Journal of Ophthalmology*, July, 1936, published monthly by Geo. Pulman & Sons, Ltd., London, England. The author, as the result of experiments conducted by himself, concludes that cod liver oil applied locally seems to promote growth of the natural tissues and to inhibit growth of scar tissue, in any case where there is loss of substance. It should be withheld in the early stages of hypopyon ulcer. It is harmless, can be used in conjunction with other necessary treatment, is cheap and easily applied.

Fifth Annual Report of the Association for the Prevention of Blindness, Bengal, 1934–35, Calcutta, India. The report tells of the great need for expansion of the Association's activities. Temporary, but avoidable blindness, writes Lt.-Col. E. O'G. Kirwan, Hon. Secretary, creates a terrible amount of unnecessary human suffering. A greater question is that of preventable blindness, for 50 to 60 per cent of blindness is preventable. Apart from cataract and glaucoma, the six important causes of blindness in India are keratomalacia, small-pox, syphilis, gonorrhea, irritant drugs

and trachoma. In addition we have other causes such as leprosy, cholera, neglected corneal ulcers, and conjunctivitis. . . . In India intensive propaganda work is required in our effort to prevent blindness. Money would be better spent in this direction than in establishing institutions for the blind, which, although humane in intention, is beginning at the wrong end. Prevention is always better than cure.

Orthoptic Training and Management of Concomitant Strabismus in Children, Lawrence T. Post, M.D., F.A.C.S., *Texas State Journal of Medicine*, May, 1936, published monthly by the State Medical Association of Texas, Fort Worth, Texas. Professor of Clinical Ophthalmology and Head of the Department at Washington University Medical School, Dr. Post presents "to the average ophthalmologist a practical and rational method of handling children who are brought to him in office or clinic for the correction of crossed eyes."

On The Scientific and Practical Value of Ionization in Ophthalmology. Recent Advances and Researches, Gustav Erlanger, M.D., *British Journal of Ophthalmology*, April, 1936, published monthly by Geo. Pulman and Sons, Ltd., London, England. The author states that the ionization method is of great therapeutic value in most of the common diseases and changes of the eyes and, when used in the uncommon and rare cases, sometimes produces astonishing and very impressive results. If used in the early stage of a disease the restoration of the function is complete. But even in chronic cases the method should be tried since it stops the progress of inflammations and is a great factor in accelerating the resorptive power of the tissues.

Book Reviews

THE EYE AND ITS DISEASES. 82 International Authorities, edited by Conrad Berens, M.D., New York: W. B. Saunders Co., 1936, 1254 p. ill.

This new textbook, representing the work of many American and a few Continental eye specialists, is designed to present the essential eye diseases to the general practitioner and physicians beginning to specialize. The subject matter is well arranged although some of the chapters are too technical to be readily understood by other than specialists. The chapters on the history of ophthalmology, heredity, orthoptic training, hygiene of the eye and the prevention of blindness should be particularly interesting to the readers of the SIGHT-SAVING REVIEW.

While the text lacks evenness, varying between elementary and specialized information, it represents a definite contribution to ophthalmic teaching. For the beginner, every phase of the subject is covered. For the specialist, much data, dormant since the last editions of Fuchs and de Schweinitz, has been collated and brought up to date.

JAMES W. SMITH, M.D., F.A.C.S.

DETACHMENT OF THE RETINA. J. Cole Marshall, M.D., London: Oxford University Press, 1936, 77 p. ill.

In this monograph of 77 pages, the author reviews the various operations which have been used for the relief of patients unfortunately blinded by detachment of the retina. Several of the operative techniques described are no longer used by eye surgeons in this country. The author frankly admits that an ideal operation for detachment is yet to be developed and therefore any text at this time can only be a review of experiences of world-wide authorities to date.

JAMES W. SMITH, M.D., F.A.C.S.

Current Publications on Sight Conservation

Note.—The National Society for the Prevention of Blindness presents the most recent additions to its stock of publications. Except for the more expensive ones, single copies are sent free upon request. Unless otherwise specified, they are reprinted from *The Sight-Saving Review.* New publications will be announced quarterly.

209. Cosmetics Detrimental to Vision, Walter I. Lillie, M.D. 8 p. 5 cts. The increasing number of eye tragedies occurring as a result of the indiscriminate use of weight reducers, hair dyes and depilatories presents a problem to the doctor, the law and the public, as well as to the beautician.

210. Sight Conservation as an Educational Problem, Richard S. French, Ph.D. 8 p. 5 cts. More than ever, educators are using motion pictures, slides and other visual aids in carrying out their work. This trend alone necessitates an added interest in a school eye health program.

211. Eye Conditions Prevalent in Early Adult Life, Wm. F. C. Steinbugler, M.D. 16 p. 10 cts. The author outlines the symptoms and treatment of those eye conditions which usually appear between the twentieth and fortieth years of life.

212. Occupational Adjustment of the Visually Handicapped, Eleanor Brown Merrill. 6 p. 5 cts. In considering how best to help in getting the right work for the visually handicapped, it is necessary to draw on the experience of rehabilitation and employment service, hospital social service, occupational therapy, work for the blind, industry, education and vocational training.

213. The Cross-Eyed Child, Brittain F. Payne, M.D. 8 p. 5 cts. For the proper correction of cross-eyes, the efforts of the oculist, general practitioner, parent and teacher are required to get the necessary co-operation of the child.

214. Conserving the Vision of Deaf and Hard-of-Hearing Children, Mary May Wyman. 8 p. 5 cts. The author points out the precautions necessary for the conservation of vision of those children handicapped by deafness or hardness of hearing.

215. Education for the Visually Handicapped, Christine P. Ingram. 8 p. 5 cts. Presenting the aims, purposes, equipment and standards for a sight-saving class, the author describes some specific experiences in the Rochester, New York, classes of which she is the supervisor.

216. Safeguarding the Eyes of Children. 8 p. ill. 5 cts. Photographs which illustrate the hazards to which the eyes of children are exposed.

D90. Why Don't We Stamp Out Syphilis? Thomas Parran, M.D. Reprinted from *Readers' Digest,* July, 1936. 12 p. ill. Stresses the importance of wiping out this plague and suggests what must be done to accomplish it.

D91. Cataracts, Abram B. Bruner, M.D. Reprinted from *Hygeia,* July, 1936. 1 p. ill. The author points out facts and fallacies concerning cataracts.

D92. Wearing Glasses, Walter B. Lancaster, M.D. 24 p. ill. 10 cts. Published by the American Medical Association. Reasons for wearing glasses, common mistakes in the way they are worn, and suggestions for their care.

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Volume VI Number 4

December, 1936

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Guarding the Sight of School Children*

Edward Jackson, M.D.

FOR the majority of people in this and other civilized countries, the activities of the years of school life present the greatest stress and danger to sight they ever encounter

THE prevention of blindness is more than keeping off the streets men or women who feel their way with white canes, or who may be guided by German police dogs. Among 1000 applicants for blind benefits in Colorado, only 300 were absolutely blind, and at the State School for the Deaf and Blind over 80 per cent had some vision.

For every one who is completely blind there are 100 who are going toward blindness, already more or less crippled by poor sight and living in the fear of what they believe will be worse than death; and a thousand who are already limited and handicapped by defects of vision of which they may or may not be conscious.

The reduced productive power of 1000 workers, the thwarted ambitions, the diverted lives, the actual disabilities of sickness produced by visual defects, may be a more important loss to the community than the complete blindness of a few which all may pity and the seeing may dread.

Percentage of Blindness That Could Be Prevented

Of those who become completely blind the most recent and reliable statistics of Harry Best in his book, *Blindness and the Blind in the United States*,[1] indicate that 72 per cent are blind from preventable causes. In a large proportion of the cases the causes

* Presented at the Annual Conference of the National Society for the Prevention of Blindness, Inc., Dinner Meeting, December 4, 1936, sponsored by the Columbus, Ohio, Academy of Medicine.

[1] Best, Harry: *Blindness and the Blind in the United States.* Macmillan.

that ultimately produce the blindness have been operating for many years before the danger of such a result provoked any attempt to prevent blindness, or was even suspected. The cases of blindness from accident include 16 per cent of the total cases of blindness and of these, more than half, 69.9 per cent, occur before twenty years of age. Practically all the cases of myopia that may lead, fifty years later, to cataract, detachment of the retina, or atrophy of the choroid, as causes of blindness, start or develop most rapidly during school life. The effective guarding of the vision of school children will prevent most of the blindness of old age; and among those who do not become blind, it will prevent a great mass of visual disability, nervous disability and chronic ill health.

For the majority of people in this and other civilized countries, the years of school constitute the greatest stress and danger to sight that they ever encounter. Almost the whole educational process is based on the use of the eyes. And yet, in general, there has been no intelligent effort to secure the use of the eyes in the safest and least injurious way and under the most favorable conditions. There has been very little teaching of how to use the eyes to the best advantage; and no warning of the dangers to be encountered, and how they may be avoided or minimized.

We have all been impressed with the swift development of modern science. Biological science and medical science are the young and swiftly developing branches on the sturdy tree of knowledge. So rapid has been the increase of medical knowledge that it has outstripped the slowly acquired capacity of the human mind to grasp and apply knowledge. For this reason, medical specialization in study and practice has been forced upon us, if we would relieve human suffering by the already known methods and resources that have become available. Yet this age of specialization has been only another step in preparation for the great expansion of medicine that is developing, from the treatment to the prevention of disease.

The last visit of Sir William Osler to America was in 1913 to deliver the Silliman Lectures at Yale University. These, which he described as "an aeroplane flight over the progress of medicine through the ages," were published under the title, "The Evolution

of Modern Medicine." Starting with the history of Egyptian, Assyrian, Chinese, Japanese, Greek and mediaeval medicine, these lectures led up to the last on "The Rise of Preventive Medicine." For more than 2000 years the epidemics of plague had devastated Europe, Asia and Africa, sometimes killing more than half the people in a city or a province. Malaria and yellow fever sealed the fate of cities, or nations. When the causes and prevention of these diseases were studied, they ceased to be terrible and are now forgotten by people who have never seen them.

Smallpox

When Jenner first tried vaccination, smallpox caused one-eighth of the blindness of the world; and it still causes such blindness where there is no vaccination. Where compulsory vaccination is enforced, it has ceased to be a cause of blindness. Ignorance, superstition and faddism still keep smallpox alive in England and in this country. In Colorado, cases occur almost every year among the isolated Mexicans in the south of the state. There have been 10 or more drawing blind benefits for blindness from smallpox. The number of these has been gradually decreasing, and in the United States it decreased one-half between 1910 and 1920. Education of the whole people is a slow method of preventing blindness; but in the end it is effective, and is the only method that can be relied upon.

Ophthalmia Neonatorum

In regard to ophthalmia neonatorum, the value of education has been well demonstrated. By 1907 the writings of Howe, Park Lewis, and others in this country, and N. Bishop Harman in England, had made it a reportable disease; and laws requiring the use of silver nitrate solution in the eyes of infants have educated the physicians and nurses to the importance of prophylaxis. Before that, the admission to homes and schools for blind children shows as high as 30 per cent blind from ophthalmia neonatorum. But from that time the numbers steadily declined, until in 1936 the percentage had come down to 7.5.[2]

[2] *Ibid.*, p. 138.

Trachoma

A similar result with regard to trachoma was achieved by the segregation and treatment in residential schools outside the city of children affected with trachoma in the County Council Schools of London. At first, two such trachoma schools were required, each accommodating 750 children. Later, only one was required and the other was closed. Still later, the cases in London did not fill the one school; and since then, children with trachoma from other parts of England are admitted to the school at Swanley.

For ophthalmia neonatorum we can rely on prevention by the Credé method only if applied within a few minutes of the time of birth. In Mexico, the health authorities have provided ampules of the silver nitrate solution for distribution in isolated districts to be ready for the emergency. The experience of Dr. Joseph Price at Preston Retreat seemed to show that prenatal disinfection of the birth canal might be equally effective and also afford benefit to the mother.

Blindness from Syphilis

We have learned in recent years that some forms of "congenital" blindness are amenable to preventive medicine. A large proportion of congenital cataracts is due to syphilis; and, by adequate antenatal treatment of the mother, even as late as the fifth month of pregnancy, these may be prevented. A form of luetic chorioretinitis appearing at birth, or in early infancy, may also be prevented. Perhaps the Wassermann test and other blood tests for lues have the greatest practical value when applied to the pregnant woman. Certainly antiluetic treatment during infancy and early years of childhood will prevent blindness from interstitial, or parenchymatous, keratitis. This was brought to the attention of our Conference two years ago by Dr. Holloway and Dr. Stokes, of Philadelphia. These facts bring out the real possibilities for the prevention of blindness. True hereditary blindness, as by microphthalmos and anophthalmos, is rare: the facts reported from the Texas Agricultural College to the Association for Research in Ophthalmology last year seem to show that such blindness may be prevented by appropriate feeding.

Prevention of Eye Accidents

The suggestion of Oliver Wendell Holmes that we must go back three generations to guard against some diseases has often been quoted with approval but practically never tried. For prevention of blindness we have never effectively guarded one generation. If this is to be done, it must begin at the beginning. Blindness at birth is quite exceptional. What we now know about it indicates that much can be done to prevent it. The bulk of blindness comes from causes that begin to operate after birth and these are for the most part preventable. The acute contagious diseases are largely under control; the prevention of accidents has been shown quite practical by the campaign for "safety first," which has been profitable in dollars and cents to the corporations that have taken it up. Since the majority of blindness from accidents comes before the completion of school life, the prevention of such accidents should begin at the beginning of school life. The formal training of the young should begin earlier than it does; and should begin with care of the body, as the body gets most of its development before the age of six years, at which age children are supposed to be ready for school. It may well begin at four. Not that there should be any rigid age limit; but the majority of children by that age should be given contacts outside the family circle and they need training that very few get at home.

Supervised Play

The two years from four to six can be given to playground, supervised exercises, based largely on games that children of that age are inclined to play, chosen largely by their own initiative and guided or restricted by intelligent understanding of health needs and progressive symmetrical development. With this can be taught the prevention of accidents; the dangers of fire, explosives and pointed implements; regard for the safety and rights of others, and the difference between activities and excesses. The concrete examples furnished on the playground may be utilized to teach effectively the basic knowledge and attitudes that are most neglected in our system of common school education. In "blind-man's buff" and variants of the game, children can easily be taught the essentials of vision and what a calamity blindness is.

Preschool Vision Testing

This preschool period is the time when every child's sight and hearing should be tested to determine whether they are ready for the use that will be expected of them when he begins to study with books, maps and blackboards, and has to be guided by the spoken word of the teacher.

The eyes have not been prepared for school work by evolution. The eyes of the lower animals are fitted to detect distant objects, and particularly moving objects in any part of the visual field; and the human eye also has this kind of vision. But this is not the kind of vision required for school work. It seems absurd that we should conduct examinations at the end of each semester, or period of the season, on the studies that the child has been over, and never take into account whether he has had a fair chance to study—to use eyes and ears—and whether they were not seriously handicapped before we put them in the mill. In school work and in the finer mechanical occupations of civilized men, distinct vision for small objects held close to the eyes must be kept up continuously. What is going on in other parts of the visual field, or at a distance, we do not need to see and is often best not brought to our attention. In the human eye this needed kind of vision is provided for by the development of the macula, a part of the retina which differs in structure from other parts and develops after birth to a greater extent than other parts. To get the best idea of small objects held close, both eyes must be directed to the same point and moved accurately together. In school work this new, exacting vision for small objects, such as letters and figures, is to be kept up a large part of the day. We must realize that school work is the hardest work that most eyes ever have to do and that such work is to be done for the most part under very unfavorable conditions.

Adequate Illumination

In playgrounds and the open fields, the eyes see by daylight illumination of from 200 to 10,000 foot-candles. In the schoolroom, even when "well lighted," the light on the book rarely amounts to 100 foot-candles, is often down to 20, and in dark parts of the room and on cloudy days, may be as low as 10 to two foot-candles. In the evening when the eyes are used for study at home, the light is

often more feeble than the poor light at school. If anyone is skeptical about the importance of good light, let him try this experiment: Take fine print, such as you can always find in a dictionary or a telephone directory; look at it in an "ordinary" light. Then take it where the sun can shine directly on it and notice the difference that makes on your ease in reading it. People say the sun is too bright. It is too bright to look at; but it is not too bright to illuminate things we wish to see. Except for the continuous reading of black print on white paper, direct sunlight is not too strong to see by. We do not need brighter neon signs at night, except where they are depended upon to supplement poor street lighting.

Another experiment that should be made in every schoolroom—at least in every schoolroom I have seen—is to measure with a light-meter the amount of light falling on the book or paper in the position in which it will be placed for reading or writing. The teacher's desk must not be excepted for any complete survey. A great deal of testing and thinking will have to be done before we can fully appreciate what it means to shut the child in from outdoor, natural light to do the difficult eye work called study.

There is a general assumption that all children can see; and parents generally assume that their children are normal. This accounts for the fact that most children come to school under the supposition that their eyes are good enough to stand the strain of school work. The more this supposition is inquired into, the more evident does it become that it is often false. Justice to every pupil can be done only when we understand his handicaps. This means that the eyes of every child should be accurately measured and tested before he is expected to read books or see things on the blackboard. This may come as a shock to those who have full confidence in their untested assumptions, but it is a simple scientific fact; and it cannot be dismissed by any statement, "It is impossible," or "It will cost too much."

Qualifications for Testing Vision

Any teacher who is qualified to teach first grade children, can test their vision. It requires only good light, simple, inexpensive apparatus, and a little study, which may prove of advantage to the teacher's own eyes and will pay for all the time and attention

it requires. The first step in guarding the vision of school children is to find out how good that vision is to start with. Then we can plan for keeping it good through school years and teach how to always use the eyes to best advantage.

In starting a policy of sight saving for all school children, difficulties will be encountered. The poor lighting in many schoolrooms cannot be replaced by good lighting for many a day. But in most of them, the lighting can be improved to some extent. In some rooms, more light can be let in by removing shades. Without rebuilding, artificial light can be introduced to supplement the daylight when that is most deficient. In other rooms, rearrangement of seats will make it possible to have more light on the page that is to be read or written upon. The hours of study and recitation can be timed so that the things that will tax sight most can be done when the light is best. The wearing of glasses will bring many who now have quite poor vision up to normal standards. This will reduce the number who must be especially favored in seating to get the best light. In all this the teacher, who understands what the children need, must be supported and assisted to overcome the resistance of principals, supervisors and school boards who do not understand what these changes are all about. Ohio is the first state with a state-wide plan for sight-saving classes—a broad rational movement for the prevention of blindness. Not only does it prevent blindness that needs a white cane or a trained dog; but it will help many others who have to contend with narrow limitations of visual acuteness and endurance.

When all this has been done, there is still need to teach each pupil how to place himself and his work so that the best light obtainable will fall squarely on the thing he wishes to see. Only by his own understanding and attention to these details of good lighting can we hope to remove all unnecessary strain and get the best conservation of vision—do the most for the prevention of blindness.

Myopia

The correction of the optical errors of the eye, by the best possible glasses, has been widely stressed and needs to be mentioned only for new emphasis. There is one defect of refraction that is

largely caused and increased by school work. The great majority of myopic eyes become myopic and increase their myopia under the influence of school work. This has been known since the eyes of school children were first examined for optical defects. All extensive statistics show that at birth nearly all eyes are farsighted; that they become nearsighted when the child has to begin to look at small objects held close to the eye; and that they become more nearsighted as the eyes are used for close seeing in school. By finding that the eyes are nearsighted—myopic—by giving glasses that will enable these eyes to see things clearly at a distance and by seeing that the child stops holding things too close to the eyes or bending down to see, the increase of myopia can be stopped in nearly all cases. Myopia might properly be called the school defect of the eye. Contending theories of myopia obscure and divert attention from the established facts; but for the prevention of blindness from myopia, what we know about it is enough to start us and keep us going in the right direction. The theory of the production of myopia by excessive convergence of the eyes in near seeing may still be disputed, but the evidence for it is so clear and widely corroborated that it need not be discussed here. The exceptions that are cited against it, under careful examination, are found to support it.

Myopia depends on serious departure of certain parts of the eye from normal nutrition. Neglected and allowed to go on through years of eye work, it usually brings extensive disease and is prone to end in choroidal atrophy, opacities of the vitreous, cataract and detachment of the retina, causing many cases of blindness. The early control of myopia and prevention of such changes in the eye are important in the prevention of blindness.

Cataract

Other departures from health in the eye contribute largely to the blindness of old age but begin years before they are so recognized. Cataract may be started when a child is born but not produce blindness that will arrest attention for many years. It is the most common cause of blindness and is mostly thought of in connection with old age; but it begins years before it is noticed, and the time to prevent blindness is when it is still non-existent. When

we remove a cataract, it is not to change the days of blindness that have already passed, but to prevent blindness in the years that yet remain. In the *Transactions of the American Ophthalmological Society* of 12 years ago was published a paper giving details of 108 cases of cataract watched for periods of from two to 19 years, an average of six years, under conditions of good general health. In that paper the conclusion was drawn:

> "For a patient of the average age of 65 years—presenting commencing senile cataract—the probability is that, under proper hygienic care, it will be 20 years before the cataract becomes mature and 15 years before he loses the power of reading ordinary print."

The paper was discussed by 15 members of that Society without any disagreement with this conclusion. Since then, a patient has died at the age of 94 without an increase of the disability caused by cataract in the 30 years she was under observation.

Glaucoma

Next to cataract, glaucoma is the most common cause of blindness in old age. Laquer, the ophthalmologist of Strasbourg, France, had his first attack of acute glaucoma at the age of 35 after a hard day in the operating room. He controlled these attacks for six years with eserine. Then he found the drug, and careful avoidance of excitement, no longer controlled the disease. He went to Horner, of Zurich, who did iridectomy on each eye, giving complete relief from the attacks and preserving good vision until Laquer's death, 30 years after his first attack of glaucoma. I have seen a case of double glaucoma, recognized by the late Peter A. Callan, of New York, who did iridectomy on one eye and advised it for the other; but under the use of pilocarpine and eserine the attacks ceased. There was no return of glaucoma in either eye, and the patient retained standard vision 15 years later.

Trachoma

Trachoma is a common cause of blindness throughout the world. Its control in London has already been mentioned. During the world war the labor companies that came to France from China,

India, South Africa and Egypt included men who suffered with trachoma. But under rigid control of these men there was no infection of others. They were sent home at the close of the war in better condition than when they came. Under our Public Health Service trachoma is being eradicated in the United States.

Conclusion—Results of Instruction on Good Sight

Besides guarding the school children from the causes of blindness to which they are especially exposed, the instruction that can be given them as to what is good sight, how it can be kept good and the importance of keeping eyes healthy will, in time, educate the whole people in the prevention of blindness for their years of productive labor and of happy leisure.

The Management of Industrial Eye Injuries in their Relation to the Workmen's Compensation Laws*

Elbert S. Sherman, M.D.

THE compensation laws have been largely responsible for the creation of the new medical specialty: industrial or traumatic surgery, in which ophthalmology plays an important part.

WHEN one thinks of industrial ophthalmology, he naturally thinks of eye injuries. Their prevention is the most important part of the whole subject. This includes such matters as preemployment and periodic eye examinations, illumination, goggles, masks and other safety devices, safety education, etc. These subjects I shall not discuss. They are adequately dealt with in various publications. The educational work of such organizations as the National Society for the Prevention of Blindness has been very effective in the reduction of the number of industrial eye injuries. There is still need for much further work along this line. Neither do I care, nor is it necessary, to say much about the treatment of eye injuries to a group of this kind. I thought that some of you might be interested in some remarks based on experiences in the management of industrial eye injuries in their relation to the workmen's compensation laws.

Let me say at once that I am not an industrial ophthalmologist in the sense that I am on the payroll of any corporation, nor do I devote a large part of my time to industrial work. I seldom visit a manufacturing plant. However, during the past 20 years I have seen quite a large number and a great variety of eye injuries which

* Presented December 11, 1936, as one of a series of talks by various ophthalmologists, for internes, sponsored by the New York Eye and Ear Infirmary.

have been sent to me either for treatment or for examinations by many industrial concerns and casualty insurance companies. I know of no class of work that is more interesting and satisfactory, but I have not permitted it to subordinate or interfere with my regular or more private practice. In order to accomplish this, separate waiting and treatment rooms are provided for workmen.

Industrial Ophthalmologists

The compensation laws have been largely responsible for the creation of a new specialty: that of industrial or traumatic surgery. Ophthalmology has felt this influence, so that now the large majority of industrial eye injuries are sent to eye surgeons who are equipped for and are willing to do this class of work. Such practitioners may be classed as industrial ophthalmologists.

At first this new field of medicine was shunned by many of the better men in the profession; the fees were comparatively small and very often some of the undesirable methods of competitive salesmanship were used in obtaining this kind of practice. Insurance companies were mulcted by excessive fees or padded bills, and other objectionable practices were engendered. Mediocre work and unsatisfactory results were inevitable. Insurance companies became suspicious of every doctor who was not known by them to be capable and honest. Disputes and misunderstandings were frequent. Gradually the insurance carriers and large employers realized that from an economic as well as a humanitarian standpoint it was to their interest to employ the best surgical skill available. Several large casualty insurance companies have now, in self defense, adopted the practice of furnishing their assured with a list of approved surgeons and eye specialists with a request that injured employees be sent only to those listed.

Workmen's Compensation Laws

Twenty-five years ago the first employer's liability laws were enacted by a few states. They are commonly referred to as Workmen's Compensation laws. Hence the now familiar terms "Compensation injuries," "Compensation work," etc., as usually used in connection with industrial injuries. Since then, similar laws have

been enacted by all the states, with two or three exceptions. In many respects they are practically alike. In most of them you will find a standard phrase taken bodily from the English act—compensation for "personal injury to an employee by accident arising out of and in the course of his employment." This sounds very plain and forthright, but there have been hundreds of legal disputes over the exact meaning of some of these simple words and phrases, and many of the court decisions are very interesting. For a long time there was much legal controversy over the meaning of the term "accident." The definition of an English court, that an accident is "an unlooked-for mishap, an untoward event which is not expected or designed," is now in common use, as the test of the accidental nature of an injury.

It was early recognized that occupational diseases could not be classed as accidents and that disabilities caused by them were not compensable. To correct this, the laws in some states were amended and certain specified industrial diseases were made compensable. (In New Jersey they are anthrax, caisson disease, poisoning by lead, arsenic, mercury, phosphorus, chromium, benzene, and its derivatives, wood alcohol and mesothorium. In some states the list is longer.)

At first regarded as a social and economic experiment, workmen's compensation laws are now universally accepted as humane, beneficent and practical. Partly because of them, much more attention has been given to safety engineering and safety education with a resulting large reduction in the number of accidents to workmen.

Aside from the direct beneficiaries, these laws have been a considerable boon to the medical profession. Formerly, the large majority of industrial injuries were cared for in hospitals and clinics, without pay. In most cases the employer, under the common law, was not liable and refused to assume responsibility for any expense, and the workman was able to pay little or nothing. Since workmen's compensation laws were enacted, medical and hospital care, including medicines and surgical appliances (e.g., glass eyes), are a first charge against the accident, and the surgeon may be sure of being paid a reasonable fee, provided he complies with a few simple requirements of the law.

Eye Injuries

Eye injuries are the most serious and expensive of non-fatal industrial injuries. In Pennsylvania, during the first eight years experience under the compensation act, more than 40 per cent of all compensation awarded for permanent injury was for eye injuries. According to Resnick and Carris,* 15 per cent. of the 100,000 or more blind persons in the United States are blind from industrial injury. There must be several times this number who from the same cause are partially blind and more or less seriously handicapped for life.

Temporary Disability

Compensation is paid for two classes of disability—temporary and permanent. Temporary disability is the period of time during which the employee is unable to work, and compensation begins after a so-called waiting period, which is usually about one week. Further treatment and observation may be continued as long as necessary but compensation, which is a major fraction—the amount varying in different states—of the weekly wage, ceases when the employee is able to return to work. Then, compensation for permanent disability, if any, begins.

Permanent Disability

Permanent disability, or impairment of function, may be partial or total in character. In the case of the eye, total disability is impairment of vision to or below the point of industrial blindness, as the result of injury—also, the loss of most of the visual field or the loss of the use of the eye as in permanent diplopia. Various courts have ruled that the loss of the use of an eye is equivalent to the loss of the eye itself. In defining the term, industrial blindness from loss of visual acuity, arbitrary standards have been established which vary somewhat, but not greatly. In most states 20/200 Snellen is the standard.

It is necessary that anyone who takes care of an industrial eye injury be familiar with the method of computing the percentage of loss of visual efficiency. In making this estimate the three pri-

* Resnick, Louis, and Carris, Lewis H.: *Eye Hazards in Industrial Occupations.* National Society for the Prevention of Blindness, Inc., Publication number 26.

mary and co-ordinate factors of vision just mentioned, viz., central visual acuity, field of vision and muscle function, must be considered. In about 95 per cent of cases, however, central vision is the only factor involved. Standards and values are not the same in all the states. A good guide, and one which I believe has been adopted in a number of states, is the Report of the Committee on Compensation for Eye Injuries, of the Ophthalmological Section of the American Medical Association, published in 1925. This is too large a division of the subject to take up at this time. Methods of computing the percentage of visual disability are not the same in all the states. It is advisable that you familiarize yourself with the method in use in the state in which you practice, and also with the compensation act.

Most cases of industrial eye injury are sent to the eye surgeon for one of two reasons: first, at the time of the accident, for treatment of the injury; and second, during the treatment or after its termination by another surgeon, for an examination and independent opinion concerning the extent of the disability, its relation if any to the recent accident, the ability of the employee to return to work and other questions pertinent to the case.

Records Which Should Be Kept

Every industrial eye injury, no matter how trivial it may seem at first, is a possible case for litigation. For this, as well as for other reasons, when first seen after the accident an adequate history should be taken, particularly as to when, where and how the present injury occurred; also any pertinent information concerning previous eye injuries and diseases. A record should be made of the visual acuity of each eye and of any evidence of former injuries or disease or gross refractive errors. Such records are sometimes very valuable when a claim for alleged disability resulting from the accident comes up in court. This may be many months or even years later. In the meantime the employee's story concerning the cause of the injury may have changed completely, as well as denial of previous eye disability. Every year employers and insurance companies pay large sums for disability, part or all of which existed prior to the accident or alleged accident on which the claim is based.

Reports

One of the duties incidental to industrial surgery is the making of reports. These are necessary. In the case of insurance companies, the surgeon's report is the authority the claim department must have for making payments for temporary or permanent disability, or for paying medical or hospital expenses. To those who are unused to compensation work, reports are irksome and unpleasant—often unnecessarily so. The large majority of eye injuries are slight, require no extended treatment, cause no disability, either temporary or permanent, and require only a very brief report. In such cases only a few questions in the standard forms sent by some insurance companies need be answered. They are interested chiefly in being informed as to three things: first, whether the case is compensable, i.e., whether the injury was caused by accident arising out of and during the course of employment; second, the extent of the temporary disability; and third, the percentage of permanent disability, if any. Most of this work can be handled by a competent office assistant, secretary, or nurse. Severe injuries and those requiring extended treatment should have more detailed reports. Insurance companies appreciate a prompt report on all cases in which there is likely to be considerable permanent disability, so that a proper reserve charge may be set up, pending settlement.

When there is likely to be some permanent disability, a final report should not be made until function has been restored as completely as possible. In most cases it is evident at once that there will be little or no disability; in a few it can be seen immediately, from the nature of the injury, that a total loss is certain. In other cases, after the acute symptoms have subsided, sufficient time should elapse for the gradual improvement which often occurs and continues over a period of months, or for the development of sequelae, before making a final examination and report. This applies particularly to corneal injuries, iridocyclitis, opacities in the lens and vitreous, partial optic atrophy and paralysis of the ocular muscles, both external and internal.

An estimate of the permanent visual loss caused by scars of the cornea should never be made during the first few weeks following the accident. Some scars which at first are fairly dense and ex-

tensive, almost completely disappear in time. I have seen eyes in which the vision was reduced by a corneal scar to industrial blindness, improve to 20/30 Snellen within a year. Likewise diplopia from paralysis of ocular muscles often clears up slowly but definitely in time.

Several years ago, at the suggestion of the plant surgeon of a large manufacturing concern which had and still has many eye injuries, I devised a small blank form which has simplified the matter of reports, and has been a great time saver in my office. It is a small sheet 5½ inches square, with blank spaces for the date, the name of the workman, the diagnosis, when to return for further treatment, temporary disability, permanent disability and the time of arrival at and departure from the office. Filling it in requires but a moment of the office assistant's time. If further treatment is required, another report is given at each visit, thus keeping the employer informed as to the progress of the case. The workman takes the report with him in a sealed envelope and the employer, if he is not self-insured, sends it to his insurance carrier. In the majority of cases, particularly those of self-insured concerns, this brief report is all that is required. For serious cases a special report is sent at the conclusion of treatment.

Complications in Evaluating Visual Loss

The evaluation of visual loss resulting from an injury is often complicated by the presence in the same eye of a non-compensable or pre-existing defect. This may be a refractive error or a pathologic change. It has been shown that such defects are present in over 20 per cent of workers.[1] In these cases it is sometimes impossible to say what percentage of the total disability is the result of the recent accident. Very often the workman will not admit that the eye was previously defective. If the case is seen soon after the accident occurred, old defects can usually be recognized as such and noted, but when, as often happens, it is sent weeks or months later for an opinion as to the percentage of permanent disability and its relation to the recent accident, the difficulties may be very great. Attempts are often made to capitalize such

[1] McAuliff, M.D., George R.: Noncompensable Visual Defects in Industrial Ophthalmology, *American Journal of Ophthalmology*, September, 1928, p. 714.

conditions as old corneal scars, lens opacities which are manifestly senile, congenital amblyopia, old trachoma and many others. I have seen cases of old trachoma with pannus attributed to recent slight eye injuries, with denial of previous eye trouble.

Occasionally, an apparently trivial injury of the cornea or a contusion of the globe is followed by changes in the eye grossly out of proportion to the severity of the trauma. The uveal tract is most often affected, the cornea less frequently. The more common manifestations are iritis, iridocyclitis, acute choroiditis, ulceration of the cornea that refuses to heal or recurs, and interstitial keratitis. These are some of the conditions which I have repeatedly seen, following very slight and superficial injuries. The underlying cause is usually focal infection. Sometimes the source of the infection is in the tonsils but more often, in my experience, it is about the roots of the teeth. When it is located and removed, the improvement in the eye condition is often strikingly prompt and rapid.

Another cause is syphilis. Tuberculosis is an occasional factor. A few years ago at a meeting of the American Academy of Ophthalmology and Oto-Laryngology in discussing a paper by Black and Haessler on post-traumatic ocular tuberculosis, Edward Jackson said: "We have only learned within relatively few years the effect of trauma in producing outbreaks of interstitial keratitis." He felt sure that he had seen several cases from slight injury of the cornea. A latent glaucoma may take on an acute form following a superficial injury of the eye.

Under the doctrine of acceleration or aggravation of a preexisting disease, the compensation courts usually make an award for any disability occurring in this class of cases, provided any probable relation between the injury and the disease can be established. Not infrequently a workman who is sent for treatment of an inflamed eye will say there was a foreign body in the eye a few days previously, but when questioned can fix no particular time when the alleged accident occurred, and may admit that he thought there was something in the eye because it was uncomfortable. In most of the doubtful cases the employer or the insurance carrier accepts the liability. If a case is clearly not compensable, the facts should be reported immediately to the employer (or the

insurance carrier) so that he may have the choice of authorizing or refusing further medical care.

Necessity for Immediate Care by Oculist for Eye Injuries

While many eye injuries because of their nature, location and extent, cause immediate and hopeless visual loss, the large majority are superficial wounds of the cornea from foreign bodies and other causes, which, if promptly and properly treated, recover quickly without loss of function, but if neglected or unskillfully handled, may cause months of disability and permanent loss of vision. Most industrial plants and insurance companies have learned from expensive experience the importance of referring all eye injuries to an eye surgeon. A few years ago we frequently saw eyes that had been manhandled by a fellow workman or a first-aid department, in an attempt to remove an embedded foreign body from the cornea; the eyes were red, painful, more or less denuded of corneal epithelium, and sometimes infected. This is now unusual. Nowadays such cases are more often the result of the good-intentioned but bungling treatment of a neighborhood physician to whom the workman has gone after working hours. Employers and insurance carriers appreciate and are willing to pay well for honest, expert care of industrial eye injuries—care which returns the workman to his job as promptly as possible with a minimum loss of vision.

If a foreign body embedded in the cornea is removed promptly and skilfully, it should seldom cause either temporary or permanent disability. Fortunately particles of steel and emery are usually sterile when they strike the eye. If the foreign body is removed without undue trauma and the wound is protected by the application of some mild sterile ointment, healing should be complete in a few hours, as the corneal epithelium regenerates very quickly. No dressing or other protection is needed in the majority of cases. More serious injuries, particularly if they are in or near the pupillary area, should have a dressing and sometimes atropine, but the indiscriminate and injudicious use of atropine, by paralyzing the accommodation for a week or more, causes the workman much loss of time. It is too often used unwisely and unnecessarily.

Variations in Visual Acuity Among College Students*

Ruth E. Boynton, M.D.

THE author presents results of an analysis of the visual acuity among a thousand college students—comparing their visual acuity at enrollment with the visual acuity at graduation

THE relation between eye health and general physical efficiency has long been recognized. Educational institutions, from the elementary schools to the colleges, by routine vision testing have attempted to detect students with visual defects, aid in their correction, and thus remedy what might be a serious handicap in the intellectual as well as the physical development of the student.

Although many studies have been made of changes in vision in children during the elementary and secondary school periods, little is known of what happens to visual acuity during the college period.

It is recognized that the visual acuity of a child may change during the child's growing years due to normal developmental changes in the eyeball. For example, it is apparently normal for young children to be hyperopic but much of this hyperopia may disappear by the age of 16 years. Collins and Britten[1] found in over 4000 school boys that a greater percentage had normal vision (20/20) at 16 or 17 years of age than at 6 years of age. A few years ago school work was thought to be a large factor in contributing to visual defects in young children. While poor lighting

* Presented at the Annual Conference of the National Society for the Prevention of Blindness, Columbus, Ohio, December 4, 1936.

[1] Collins, S. D., and Britten, R. H.: *Public Health Reports*, Vol. 39, No. 51, December 19, 1924.

in the schoolroom, poorly printed books and bad reading habits undoubtedly may have some deleterious effect upon vision, the literature on this subject today leads to the conclusion that some factor or factors other than those found in the school are more important in producing deviations from the so-called normal vision.

Vision testing, usually by means of the Snellen test, has been done routinely as a part of the physical examination required at entrance by most colleges and universities for many years. The limitations of the Snellen test in selecting all cases with refractive errors are well recognized. At best, it is but a coarse screen. With it the individual with myopia will be discovered, but the hyperopic student or one with a moderate astigmatism may have a 20/20 vision and still have a refractive error sufficient to be a real handicap.

It is inevitable also in testing large groups with the Snellen test, unless the test is done with less haste than that usually employed, that some errors will be made. On re-examination, some individuals whose original test showed a visual acuity of 20/30 or even 20/40 may be found to have 20/20 vision. It is important to keep in mind these limitations and possible causes of misinterpretation of this test.

At the University of Minnesota the vision of all entering students was tested on the Snellen Chart. In the College of Education and the Medical School, complete physical examinations which include the Snellen test are required not only on entrance but also before graduation.

An analysis of the results of the Snellen test done on 1000 university students at the time of entering the university and again at the end of four years has been made. The material which has been collected will be presented under four headings: (1) the visual acuity of college students at time of entering the university; (2) changes occurring in visual acuity during four years in college; (3) the relation between eye symptoms and visual acuity as measured by the Snellen test; and (4) the relation between visual acuity and academic achievement.

The vision testing was done at the entrance examination either by a nurse or a senior medical student, while the tests were done by a nurse in the senior examination. The vision was recorded as

20/20, 20/30, etc. In this paper a vision of 20/40 means 20/40 in one eye and 20/40 or better in the other eye.

These data are based upon vision tests with the Snellen chart without glasses. It does not mean, therefore, that all students showing visual defects are necessarily handicapped by these defects, as many students had been fitted with glasses before coming to the university and others procured them during their university career.

TABLE I.—VISUAL ACUITY OF 1000 UNIVERSITY STUDENTS GIVEN SNELLEN TEST

Vision	Entrance Examination		Senior Examination	
	Number	Per cent	Number	Per cent
20/20	524	52.4	511	51.1
20/30	264	26.4	195	19.5
20/40	30	3.0	55	5.5
20/50	26	2.6	25	2.5
20/70	25	2.5	46	4.6
20/100	43	4.3	37	3.7
20/200	59	5.9	73	7.3
20/–	29	2.9	58	5.8
	1000	100.0	1000	100.0

The visual acuity according to the Snellen test of 1000 university students at the time they entered the university and at the end of the senior year is presented in Table I. The vision recorded is without glasses. There are about an equal number of men and women in the group and, since it was found that there were no significant sex differences, the data are presented without sex designation. Of the 1000 students, 52.4 per cent had 20/20, or so-called normal vision; 18.2 per cent had a vision of 20/50 or less. Collins and Britten[2] classify this as markedly defective vision. In the examination of 894 male industrial workers between the ages of 20–24, they found 9.6 per cent with a vision of 20/50 or less, or about one-half the frequency found in university students.

At the time of the senior examination there was a slight decrease in the proportion of students with a 20/20 or 20/30 vision while the

[2] *Ibid.*

proportion with a vision of 20/50 or less had increased from 18.2 per cent to 23.9 per cent.

In order to obtain a better picture of the change in vision in this group of university students they were divided into three groups: "A"—those showing no change or a decrease in vision of one line in one eye on the Snellen chart during the four years in college; "B"—those showing a decrease in vision of one line in each eye or two lines in one eye; and "C"—those showing a decrease in vision of two or more lines in each eye or 3 or more in one eye.

Table II.—Decrease in Visual Acuity During Four Years in College as Measured by the Snellen Test

	Number	Per cent
A No change or slight decrease	790	79.0
B Moderate decrease	61	6.1
C Marked decrease	149	14.9
Total	1000	100.0

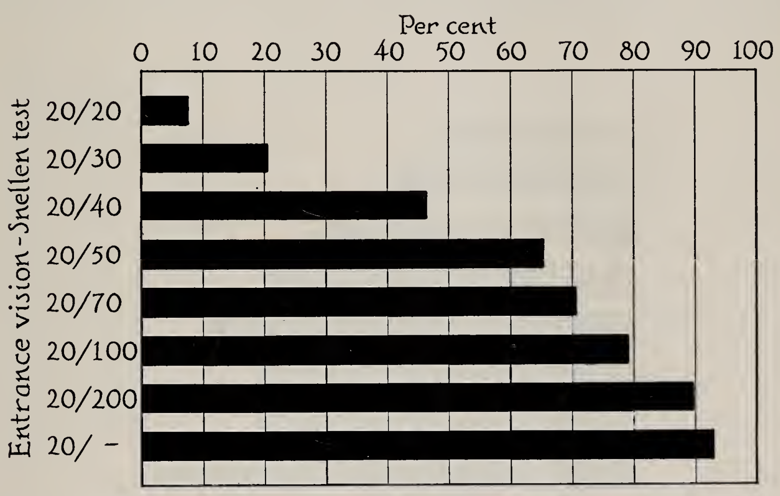
Table II presents these data. Of the group, 79 per cent had no change or very slight decrease in vision according to the Snellen test; 6.1 per cent a moderate decrease; and 14.9 per cent a marked decrease in vision.

Table III.—Decrease in Visual Acuity During Four Years in College in Relation to Vision at Entrance as Measured by the Snellen Test

Entrance Vision	No Decrease		Moderate Decrease		Marked Decrease	
	Number	Per cent	Number	Per cent	Number	Per cent
20/20 or 20/30 Total—788	680	86.3	52	6.6	56	7.1
20/40 or 20/50 Total—56	28	50.0	6	10.7	22	39.3
20/70 or more Total—156	82	52.6	3	1.9	71	45.5

The decrease in visual acuity during four years in college in relation to the vision on entering college is presented in Table III. The group having the lowest visual acuity when entering the university had the most marked decrease in vision at the end of four years. The majority of these students were undoubtedly myopic, a type of refractive error which is frequently progressive. It is significant also that 7.1 per cent of the group with a 20/20 or 20/30 vision at entrance had a marked decrease in vision. It is unfortunate that we do not have the results of a complete ophthalmological examination to give us information about the actual changes responsible for this loss of visual acuity.

Chart I.—Students Having Glasses when Entering the University



Of the 1000 students in this group, 257, or approximately one-fourth, had glasses when they entered the university. The percentage having glasses in each vision group is shown in Chart I. It is evident that the less the visual acuity, the greater is the percentage who have made an effort to secure correction with glasses. Whether this step-like increase in the number wearing glasses represents a true picture of the need for refraction in each vision group, or is due partly to the fact that in vision testing in the lower schools the student with the greater visual impairment according to the Snellen test is the one advised to have a refraction, it is impossible to know.

The importance of eye symptoms as an index of probable refractive errors, in addition to the Snellen test, has been emphasized, especially with younger children. It seemed probable that in university students symptoms related to the eyes might be some indication of visual defects. In the history which is taken at the time of the entrance physical examination at the University of Minnesota the student is asked to check if he has any of the following symptoms related to the eyes: aching eyes, eyes sensitive to light, inflamed lids, styes, blurred vision without glasses, blurred vision with glasses, double vision. Of the entire group of 1000 students, 43.4 per cent checked one or more of these symptoms.

Chart II.—Students Giving History of Symptoms Related to the Eyes when Entering the University

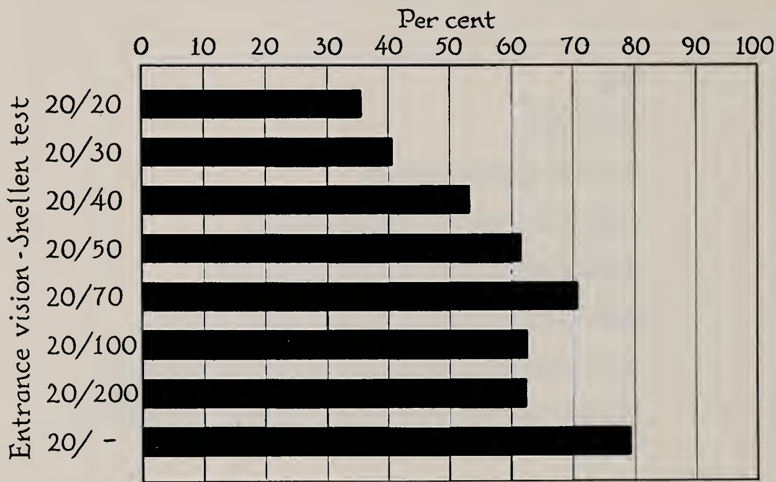


Chart II shows graphically the percentage of students in each vision group who had checked one or more symptoms related to the eyes at the time of the entrance examination. As one would expect, a greater percentage of those students with the lowest visual acuity had symptoms referred to the eyes. However, it is of interest that 35.9 per cent of those with a 20/20 vision and 40 per cent of those with a 20/30 vision complained of eye symptoms. Since it is a natural tendency to advise students with a vision of 20/40 or less to see an ophthalmologist and to consider the vision of 20/20 or 20/30 as within normal limits, the fact that 35–40 per cent of these

so-called normal students complained of eye symptoms would indicate that probably greater attention should be given to this group.

Evidence that eye symptoms in college-age students should receive more consideration is presented in Table IV.

Table IV.—History of Eye Symptoms in Relation to Vision Test in Students Fitted with Glasses at the Health Service

Vision	Number Fitted With Glasses	History of Eye Symptoms	
		Number	Per cent
20/20	74	42	56.8
20/30	62	34	54.8
20/40	12	8	66.7
20/50	10	6	60.0
20/70	9	6	66.7
20/100	23	16	69.6
20/200	26	15	57.7
20/–	13	10	76.9
Total	229	137	59.8 (average)

Of the 1000 students, 229 in the group were examined by an ophthalmologist at the Students' Health Service and glasses were prescribed at some time during their four years in the University. The percentage having symptoms related to the eyes was almost as great among those with a 20/20 or 20/30 vision as among those with lower vision. The 20/20 group and the 20/200 group had approximately an equal percentage with eye symptoms. There is but little doubt that a careful consideration of eye symptoms, especially in students in whom the Snellen test reveals a 20/20 or 20/30 vision, will aid in selecting those who should be referred for further study.

Further evidence of the importance of eye symptoms is shown by the fact that the students who showed the greatest decrease in visual acuity during four years were the students who had the largest percentage of symptoms related to the eyes when they entered the university.

The interest of colleges and universities in the performance of visual tests and in the correction of visual defects is to prevent and

remedy handicaps which might interfere with the health and academic achievement of the student. Although the question of the relation between visual acuity and success in school is not strictly related to the subject of this discussion, it is of interest to all people engaged in educational work. Therefore certain data pertaining to this were collected and will be presented.

All freshmen students entering the University of Minnesota are given a College Ability Test which is supposed to give an index of the student's aptitude for college work. Students ranking in the upper quartile in this test are far more apt to succeed in college than those in the lower quartile. The ranking in the College Ability Test was obtained on 378 of the 1000 students included in this report and tabulated according to the vision test on entrance to the university. This is presented in Table V.

TABLE V.—COLLEGE ABILITY TEST IN RELATION TO VISION IN 378 STUDENTS

Vision	College Ability Test							
	75–100%		50–74%		25–49%		0–24%	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
20/20 or 20/30	71	73.2	73	75.3	79	84.0	82	91.1
20/40 or 20/50	3	3.1	5	5.2	5	5.3	2	2.2
20/70 or worse	23	23.7	19	19.6	10	10.6	6	6.7
Total	97	100.0	97	100.0	94	100.0	90	100.0

In this test, 23.7 per cent of the students in the upper quartile, had a vision of 20/70 or less while only 6.7 per cent of those in the lower quartile has such low visual acuity. Although the number in each group is small, applying the Chi square test it is found that there are 249 chances in 250 that this difference is real and not due to chance alone. In other words, a larger percentage of those students with the best chance of succeeding in the university had lower acuity of vision than did those with the least chance of scholastic success.

That this prediction is apparently true is shown in Table VI, which presents the scholastic achievement of 194 medical students in relation to their vision on entering the medical school. The scholastic achievement is the average of all grades during the four years in the medical school. Those students ranking in the upper one-fourth of the class are compared with those in the lower one-fourth. Of the students standing in the upper fourth of the class, 31.7 per cent had a vision of 20/70 or worse, while only 11.5 per cent of those in the lower fourth of the class had as low vision. There are 19 chances in 20 that this is a real difference.

Table VI.—Scholastic Achievement and Vision of 194 Medical Students

Vision	Scholastic Ranking in Class			
	Upper One-Fourth		Lower One-Fourth	
	Number	Per cent	Number	Per cent
20/20 or 20/30	25	61.0	49	80.3
20/40 or 20/50	3	7.3	5	8.2
20/70 or worse	13	31.7	7	11.5
Total	41	100.0	61	100.0

Thus, both in the prediction for success in college as measured by the College Ability Test and in actual achievement, a greater percentage of the higher ranking students were found to have markedly defective vision than of the lower ranking students.

Without doubt, the majority of students with a vision of 20/70 or worse are myopic. Why the individual with myopia should be a better student than one with normal vision is not entirely clear. It may be that because of the myopia, the student has been unable to succeed in games and sports as well as the child with normal vision and therefore has turned to books as a substitute and thus has developed habits of reading and study which are superior to students who have a broader field of activity.

That continued use of the eyes for close work may be a factor in producing myopia or in the progression of an already existing myopia is accepted by many. In this group the defective vision in

the better students may, therefore, be the effect rather than the cause of studious habits.

Another possible explanation may be that the student with a 20/20 or 20/30 vision may actually have a hyperopia of sufficient degree to make close work difficult and therefore the amount of time spent on study may be much less than that spent by the myopic student for whom reading usually causes no discomfort. An analysis of the eye symptoms in the medical students with a 20/20 or 20/30 vision showed no difference between those ranking in the upper fourth and those in the lower fourth of the class, leading one to doubt this last supposition. Whatever the explanation, the nearsighted student seems to succeed better in university work than the student with so-called normal vision.

Summary

In summarizing, the following points are emphasized:

1. Of 1000 University of Minnesota students tested by the Snellen test at the time of entering the university, 52.4 per cent had a 20/20 or so-called normal vision and 18.2 per cent a visual acuity of 20/50 or less.

2. The same group of students given a Snellen test at the end of four years in the University showed 23.9 per cent with a visual acuity of 20/50 or less.

Of the entire group, 14.9 per cent had a decrease in vision of two or more lines on the Snellen chart in each eye or three or more in one eye.

The students having the lowest visual acuity when entering the university had the most marked decrease in vision at the end of four years.

3. Eye symptoms are important in selecting students who should be referred for further examination. Of 229 students fitted with glasses at the Students Health Service, almost as great a percentage of the students with a 20/20 or 20/30 vision had complained of eye symptoms as of those with marked decrease in visual acuity according to the Snellen test. It should be remembered that the Snellen test will not detect many cases of hyperopia or moderate astigmatism.

4. In a College Ability Test given to 378 students in this group when they entered the university and in the scholastic achievement of 194 medical students at the end of four years in the medical school, the highest quartile in each group contained a significantly greater percentage of students with a vision of 20/70 or worse than did the lowest quartile. The better students had the poorer eyes.

Congenital and Hereditary Diseases of the Eye*

E. Clifford Place, M.D.

CONGENITAL and hereditary diseases account for about one half of all blindness; many of these diseases could be reduced through intelligent medical and public co-operation

WHENEVER I see a person of 70 years of age or thereabouts, whose appearance and tissues and eyes resemble those of one ten or fifteen years younger, upon questioning I am likely to find that his forebears were long-lived and robust on either the maternal or paternal side or both. And it causes me to think, and often to say, "How wise it is to choose good ancestors!" But if this be but a pleasantry, its corollary, namely, "How wise for ancestors to choose good offspring," may well have practical value!

It was interesting to read in two recent issues of the magazine, *The New Yorker*, of an interview with some of the survivors of the Oneida Community, that unusual experiment in communism and eugenics which flourished in New York State for a time in the past century and in which, of 58 births, only four were unplanned. It appears that all the descendants of this experiment were unusually vigorous, intellectually and physically, and though I know of no statistics about their eyes, I have no doubt these were as healthy as the rest of their bodies.

One hears but little of eugenics nowadays and it is rather a pity. Legislation, which influences the conditions for marriage in some states, may not go a long way towards improving the race; but

* Presented at the Institute on Conservation of Vision, Brooklyn, N. Y., April 16, 1936; arranged by the Bureau of Prevention of Blindness of the Division for the Blind, New York State Department of Social Welfare; and sponsored by the Eyesight Conservation Committee of the Brooklyn Health Council; Medical Society, County of Kings and Academy of Medicine; and the Brooklyn Ophthalmological Society.

education can be the potent factor to aid in influencing human beings to give some of the thought to the propagation of the race that they give to the breeding of cattle, horses and dogs. A knowledge of some of the congenital and hereditary defects of the eye may well help to stimulate such thought, for of all the organs of the body, people are likely to cherish their eyes the most.

Though the fertilized ovum is but a single microscopic cell, in it are all the potentialities of character and physique, good and bad, which derived from countless generations before it. It is fascinating to think of and to speculate as to how this tiny bit of protoplasm can hold such manifold possibilities. To quote, "The inexplicable and unknown have ever had a charm for theorists, and a search for a satisfactory explanation of congenital defects has been productive of many hypotheses."

This single cell multiplies by dividing, which sounds like a paradox. It breaks into two cells; each of these divides into two others and so on, until the billions of cells of greatly differentiated types finally become a human entity. Of them all, the cells which develop into the eye are among the most highly specialized and hence most likely to be profoundly affected by influences of temperature, drugs, chemicals, nutrition and disease. To quote again, "The normal development of the eye in its various parts is so exquisitely timed and ordered that a hesitancy at one point or the persistence past its allotted time of a temporary fetal structure at another point may so unbalance the normal procedure that a recognizable defect is produced in the completed eye."

Congenital defects need not be hereditary, nor are hereditary defects necessarily congenital in the sense that they are present at birth. In the first place, many congenital defects are present in individuals in none of whose ancestors can similar defects be found. On the other hand, many hereditary eye conditions are not present at birth, such as squints, cataracts, optic atrophies, and the like, but they develop later and in some cases only in mature and late life. They are nevertheless hereditary if similar eye defects occur in previous generations in the same family. Similarly, many diseases which we consider congenital are not present at birth—ophthalmia neonatorum, interstitial keratitis, etc.—but they are latently present and unfold in time.

Congenital and Hereditary Blindness in Children

In a recent study and report on *The Causes of Blindness in Children*,* Dr. Conrad Berens reported an analysis of 2702 children in schools for the blind. He classified them as to age distribution, amount of vision remaining, etiologic cause, and topographic cause, that is, the cause with relation to the part or parts of the eyeball involved. This report indicated that of these 2702 cases, more than half—51.1 per cent—of the blindness was due to congenital and hereditary causes. This gives to a consideration of the subject a weight which cannot be much diminished by the fact that probably a good many of these cannot be eliminated. Accidents and arrests of development will very likely always occur; nevertheless, a goodly percentage will remain, which by education of both the profession and the public can be avoided.

Some further statistics in this report are interesting. It discloses that 31 per cent of the cases were due to disorders of the entire eyeball, developmental anomalies, such as megalophthalmus (large eyes), microphthalmus (tiny eyes), albinism and refractive errors. Sixteen per cent had optic nerve defects, of which half were congenital and hereditary; 15 per cent had cataract; and 10 per cent were the result of ophthalmia neonatorum, whereas but two per cent were directly due to syphilis. I say directly because the suspicion that syphilis was a factor enters into the causes of many other of the defects.

The explanation of ocular anomalies is still in a highly theoretical state. By some they are considered purely developmental—a lack, an arrest or a maldevelopment; to others the answer lies in intrauterine inflammation, and still others believe both are responsible. The last seems to many the most logical explanation. In the purely hereditary defects, neither factor would seem to be involved, for here the knowledge of the defect, if one may put it in that way, is inherent in the germ cell and will usually influence the formation of the defect, regardless of other factors, in accordance with Mendelian laws.

Congenital eye defects are frequently multiple and are often

* Berens, M.D., Conrad, Kerby, B.A., C. Edith, and McKay, B.A., Evelyn C.: *The Causes of Blindness in Children*, National Society for the Prevention of Blindness, Inc., 1935, Publication number D-85.

associated with variations elsewhere in the body—microcephalus, harelip, cleft palate, spina bifida, etc. Colobomas of iris, ciliary body, retina, nerve and choroid are commonly found together, though they may exist singly. The term, coloboma, is derived from the Greek and means a congenital fissure. It is a fairly common fault and occurs in either lid as well as in the lens and other structures mentioned. While in the lid plastic surgery may accomplish a good deal, nothing can be done for a coloboma elsewhere in the eye.

Babies have been born without eyes, or with microphthalmia—rudimentary eyes. Others have megalophthalmus, one form of which is better known as buphthalmos or infantile glaucoma. In this condition all the eye structures are larger than normal, resembling an ox eye, and the thinned and stretched sclera permits the underlying choroid to show, coloring the sclera a grayish blue. This may be unilateral but is often bilateral and generally leads to serious visual defects. It is frequently hereditary as well as congenital. Treatment is unsatisfactory. The etiology is unknown but a recent writer suggested a possible hook-up between thymus hyperactivity and buphthalmos.

The eyes of healthy babies frequently suffer violence in the perilous passage of the baby to the outer world at the time of birth. The head is compressed and molded by various forces during this period and Rowland in 1927 studied the eyes of 400 infants within the first 24 hours after birth. He found 11, or 2.75 per cent, with scattered hemorrhages in the retina, 194 with hazy optic discs and 31 with lesions other than those of the eyes. He was able eight years later to report on the condition then of 17 of these babies and at that time all of these cases had cleared up, showing no trace of any lesion attributable to the birth injury.

However, birth injuries do cause permanent lesions which must be classed as congenital. A central hemorrhage—one in the macula—is likely to leave a permanent fault in the vision by destroying the delicate retinal elements at this point. Hemorrhages in certain parts of the brain and nerve sheaths will affect vision as well as the nerve control of various of the eye muscles, producing partial or complete paralysis and hence strabismus of the paralytic type. Add to these the direct injuries occasionally produced by forceps

in instrumental deliveries, and permanent lesions of the cornea, lids and muscles will add to the total of this source of congenital defects.

Edgerton, in 1934, writing on the same subject, spoke of contributing causes of brain and retinal hemorrhages in the newborn. He reminds us that premature infants are more disposed to hemorrhage as the blood vessels are weaker and more vulnerable. Since calcium is an important factor in the coagulation of the blood, a maternal deficiency in this element is significant. Here dietary errors must be considered as well as a deficiency of parathyroid secretion which has to do with the metabolism of calcium. Chief among dietary errors are those which provide a deficiency in vitamin B. Contrary to its habit with vitamin A, the body stores little of vitamin B; hence, it must be a part of the daily diet. Its prominent sources are milk, eggs, vegetables, cereals, liver and kidneys.

Edgerton further mentions syphilis as a cause of weakness in mother and child, with fragility of the blood vessels.

Vitamins

At this point it may be well to mention some reports in the literature bearing further on the relation of the vitamins to our subject. O'Brien, in a recent communication, gives the details of some experiments with white rats, in which besides general growth variations, he was able at will to produce cataracts by feeding a diet free of vitamin G found in yeast, rice, wheat, fresh meats and green leaves. Hale, at the Texas Agricultural Experiment Station, experimented with pigs. In the course of an investigation of the effects of vitamin A on swine, he fed a gilt, which is a young sow, a vitamin A free ration for 160 days before breeding and for the first 30 days after breeding. She farrowed a litter of 11 pigs, all of which were born without eyeballs. Interested in this phenomenon, he reproduced the occurrence twice in subsequent experiments. One case was particularly interesting. The preliminary period of vitamin A free feeding was for the purpose of depleting the animal's tissue of this vitamin which, unlike vitamin G, is stored in the body. In this test two gilts were studied. On the 176th day of preliminary feeding one of the gilts was so affected

that she was unable to get up. A two-ounce dose of cod liver oil was given her and within eight hours she was able to walk. When these animals farrowed, the one who had received no cod liver oil produced ten pigs, none of whom had any eyes, while the one who had received the one dose of cod liver oil produced a litter of 14, all of whom had varying eye defects. Some had no eyes, some one eye, some with one large and one small eye, but all were blind. Thus he concludes that a maternal deficiency, even in the human race, in vitamin A may suffice to produce congenital eye defects; and that we may have been forcing our spinach on the wrong victim; it ought to be administered to the mothers instead of the children.

That vitamin A exerts a powerful influence on the eye has long been known but this article evokes new interest in its possible effects on the development or maldevelopment of the eye. Blegvad in 1924 gave an exhaustive report on a series of cases of xerophthalmia, keratomalacia and hemeralopia which occurred in Denmark from 1909 to 1920 due to low economic conditions prevalent at that period. He states that the primary source of vitamin A is in green leaves of plants—not in vegetables, oils, tubers, etc.—while it is abundant in butter, milk, eggs and cod liver oil. Thus this fat soluble vitamin is generally found in connection with fats and is stored in the body in the reserve fats thereof, and so he reasons that a too great abundance of carbohydrate in the diet may be bad as it impedes this mobilization. Margarine, especially vegetable margarine, contains little vitamin A. Thus it was a prolonged diet deficient in this vitamin which was the cause of the eye diseases mentioned above. There is a reserve supply kept in the system of the gravid or nursing mother but if the proper food is not taken for a long time, this reserve is depleted and the mother and child suffer. Thus the eye economy of the unborn child may be affected by a deficiency diet in the mother.

Ptosis

Ptosis is a not uncommon congenital affection, involving one or both eyes, and indeed it may be hereditary as well. It may occur alone or be accompanied by paralysis of one or more of the muscles which move the eye, in which case there will be convergent or

divergent squint or a difference in level of the two eyes. It may occur as a developmental or hereditary defect or may be the result of pressure, either natural or by instruments during birth. It is quite disfiguring, the drooping of the lids, especially when bilateral, causing the patient to go through life with his forehead wrinkled and head thrown back in order to peer out beneath this paralytic curtain. Although this is less true if the affection be onesided, nevertheless it gives a rather sinister cast to the expression.

I remember very well a young man of about 27 upon whom I operated some years ago for bilateral ptosis. He had gone all these years with the handicap described above and in addition the weight of his lids made him go to sleep on reading or even at the theatre. But at this time he married and then the situation changed. No longer was he to be permitted to spend his evenings in somnolence; so at the urging of his new wife he permitted the operation. It was fortunately as successful as these cases can be and henceforth he was able to face the world with level gaze and to keep awake when social amenities required it. Operation in these cases, though functionally successful, is not always perfectly so cosmetically. But it is a great help.

Strabismus

Other muscle affections which are congenital, hereditary or both, are the great groups of strabismus of various kinds. When paralytic, it is present at birth and noticeable after the first few weeks when the child begins to be able to fix its eyes upon objects. In the other more usual types, the conditions are present but latent, to develop into squint when the child begins really to use its eyes, especially for close objects—pictures, books, toys, etc. Many times, upon questioning the parents, one learns that the father had a turn or a cast in his eye as a boy, or an aunt, uncle, or a grandparent. People really should be more careful whom they marry if they expect to bear physically perfect children. In some cases what should be a muscle is found to be a firm cord of fibrous tissue, a developmental defect definitely limiting the excursions of the eye. Treatment with exercises, glasses and operation is effective in the ordinary type of squint but useless in this particular form.

Blindness Due to Syphilis

Aside from the opacities of the cornea resulting from interstitial keratitis, due mostly, as I have said, to congenital syphilis and developing some time after birth—I have now under my care a man in his late twenties with interstitial keratitis—aside from these, babies are occasionally born with cloudy corneas. The visual defect occasioned will naturally depend upon the location of the opacity, whether in the pupillary area or not, and upon its size and density. Some are thought to be due to intra-uterine inflammation and others to adhesions and late separation of the cornea from other parts during development. They are often associated with other defects—dermoid tumors, colobomas, etc.

Ophthalmia Neonatorum

Ophthalmia neonatorum, "babies' sore eyes," has been known for centuries. Between 7 and 10 per cent of all blindness is the result of this infection. Babies acquire this from the birth canal of an infected mother during delivery. Typically, such a baby will appear normal at birth but in from one to ten days the lids will swell, redden and from between them will exude thick yellow pus. The swelling of the lids is such as to seal the eyes so that when they are forcibly separated for treatment and inspection, the dammed back pus may occasionally spurt forth into an eye of the luckless attendant. More than one nurse has thus been infected; and deadly as this disease is to a baby's eye, it is even more so to an adult's.

The gonococcus readily attacks and invades the cornea, producing ulcers, infiltration and perforation. Thus the final result is a deeply scarred and opaque cornea, and often a deformed and shriveled eye—sightless in either case. Both eyes are generally simultaneously involved.

Cases occur, however, in which this classical picture does not present itself. I recently saw a case at the Methodist Hospital—there have been only two or three there in years—in which there was no lid swelling and the pus was thin and watery. Here the microscope alone must make the diagnosis in the early stage. However, the cornea, which became cloudy and ulcerated, was invaded just the same. The condition seemed to be under control

when baby and mother were transferred to a city hospital and I lost sight of them. I hope it continued to improve. The significant feature of this case for us is this: the Methodist Hospital runs a well staffed, well equipped and well attended prenatal clinic. Here many women come as early as their third month of pregnancy for advice and guidance. The blood of every one of them is subjected to a Wassermann test and in any who give a history of venereal infection or who have a vaginal discharge, a microscopic examination of a smear is made. If these tests prove positive, corrective treatment is instituted and when this is properly carried out, a healthy baby may be, and is, expected. This particular mother was what they call a "walk in case." She walked into the hospital for the first time when in actual labor and no prenatal care could be given. The last case of gonorrheal ophthalmia that I saw in the same institution was in a similar situation. This one was an unmarried mother, who was infected and had no prenatal care; both the baby's eyes were lost. The child was premature and hence its tissues were an easy prey to the gonococcus. These are significant facts in prevention of this scourge. The prenatal clinics are accomplishing wonders in the care of expectant mothers and the prevention of these as well as other serious troubles for the little lives they carry.

The iris has been mentioned: it may be the subject of a coloboma, holes may exist, the pupil may be deformed, or no iris at all may be found—aniridia with amblyopia and nystagmus. Iritis, if present at birth, is believed to be syphilitic in origin. The other faults are accidents of development.

Affections of the Crystalline Lens—Cataracts

The crystalline lens is a fertile field for these affections which we are discussing. It is an important structure in the economy of the eye, its usefulness depending upon its having the proper shape, position and transparency. Hence disturbances here lead to serious visual defects. The lens may be notched, which is not so bad; it may be displaced, upward, outward, or both, not often downward, or it may be clouded, in part or in whole. Displacement, called ectopia, interferes with the proper focusing of light on the retina and if the displacement is great enough to bring the

edge of the lens into the pupil, there will be no focusing at all of light which passes through part of the pupil, except that inadequately provided by the cornea. People with this condition are likely to have vision reduced to 20/200 or 20/100. Lloyd has recently described anew a familiar group of defects labelled arachnodactyly, in which dislocated lenses are prominent features, together with very long and thin bones, heart disease and tiny pupils. It is an hereditary affection. Opacifications of the lens are called cataracts and may vary in location and extent. A small spot may exist on either the anterior or posterior surface, generally in the center, and thus form either an anterior or posterior polar cataract. Since it is in line with the center of the pupil, some disturbance of vision will naturally result and the degree of dimness will depend upon the size and density of the spot: vision under these circumstances may vary from 20/30 to 20/200 or even less. Operation is likely to give considerable improvement in the bad cases but in those whose vision is as good as 20/40 or 20/50, it is usually advisable not to operate. Another common form is zonular or lamellar cataract in which a clouded disc is present in the center of the body of the lens. The same statements as to vision and treatment hold true for these as for the types mentioned above. If not operated upon, these cataracts remain stationary, so that the vision does not deteriorate. Some of these cases are merely congenital; others are hereditary.

There is, however, a definite hereditary tendency to cataract of the senile type in some families. Vinsonhaler, in reporting on six generations of such a family in which the age of the individuals at the time of development of the cataract varied from as great as 70 to as young as 27, stated again Nettleship's rules in these families as follows:

1. Descent is direct. No generation is skipped;
2. If all children in one family have cataract, the liability of the next generation is increased;
3. Transmission from like sex to like sex is most common;
4. The cataract tends to appear earlier in life in succeeding generations;
5. The age of onset is approximately the same in persons of the same generation;

6. The families with cataract are not affected as to fertility, health or longevity.

One further fact about cataracts: Pagenstecher has produced congenital cataracts in rabbits by feeding naphthalin, which indicates that a toxic origin may be a possibility in some of our cases.

Other Affections Due to Maldevelopment or Heredity

It would be wearisome to enumerate and describe in detail the affections of all the ocular tissues which maldevelopment and heredity may produce. They are legion. A few of the interesting ones remaining will suffice. Hereditary optic atrophy or Leber's disease is one. Its inheritance is sex limited, that is, it is transmitted through females, but affects only males. The same peculiarity features color blindness—women rarely suffer from it, but their sons do.

Nystagmus.—This is the term for dancing eyes, which we not uncommonly see. The eyes oscillate, rapidly or slowly, horizontally, vertically or in a rotary fashion. It is associated with some cataracts, aniridia and other lesions, while in some babies no physical cause can be seen. Moorad, in a recent communication, states that nystagmus generally shows itself first at the age of six or seven months, that it seems to occur more often in the homes of the poor and in the winter months, where and when there is lower illumination. He suggests as a possible help in treatment greater illumination.

Albinism.—Albinism, where the bleached iris and retina cause diminished vision, often with nystagmus, occurs but is not common. Consanguinity in the parents is thought to be a factor in some cases.

Refractive Errors.—These are commonly handed down from one generation to another. This is particularly so in myopia and in high degrees of hyperopia and astigmatism. In my experience, inherited myopia is not apt to be seriously progressive unless it be of high degree. Progressive myopia seems to be an acquired disease and frequently occurs in children whose parents have good eyes.

Glioma.—Glioma is fortunately not common but may affect both eyes. It is a form of cancer usually originating in the retina,

which by its growth destroys the eye and by spreading through the body to other organs causes death. The early removal of the eye is an essential in the treatment. Heredity occasionally plays a part.

It not infrequently happens that the tear duct is obstructed at birth, either by a failure for it to grow completely down to the nose or by a plug of mucus and detritus. This leads to conjunctivitis and occasional formation of abscess in the tear sac. Many of these stenoses clear up spontaneously as the child grows and develops, but some do not. Fortunately, treatment is usually satisfactory and recovery prompt. An irrigation or dilatation of the duct done once or twice is generally sufficient.

Conclusions

1. Congenital and hereditary diseases account for about one half of all blindness.

2. Many of these defects cannot be cured or prevented by any means now at our disposal.

3. A goodly percentage remains which can be partly or entirely prevented by greater use of the knowledge and means now at hand.

Physicians should appreciate more fully the importance of early recognition and treatment of syphilis; the public should be taught the need of the blood test early in pregnancy or before: I say early because many of the important eye structures are formed in the first weeks of embryonic life. Public sentiment should be educated to prohibit the marriage of the hereditary blind. Prenatal clinics should be attended earlier and by more women. The same holds true in private practice. Nutrition is a factor in embryonic life and may greatly influence the development of the eye. Doctors, nurses, social workers and teachers can all aid in this program through their contacts with parents and their influence upon them. More thought should be given by young people to the subject of marriage and mating.

Conservation of Vision—Infant and Preschool Age*

Albert Frost, M.D.

THE author emphasizes the need of thorough medical eye care in children before they reach school age, especially in such cases as cross-eyes and congenital cataracts

AS you know, the oculist has very little opportunity of seeing children professionally—at least normal children—until after they have reached the school age, and in many cases, through neglect and ignorance, a great deal of valuable time is lost. I think that it is particularly appropriate that we try to present to your group which contacts so many people, including children, throughout the state, some of the problems that confront the oculist. I hope that you will be able to carry to those whom you contact, the message that after all it may be the safest thing to have every child's eyes examined early in life by a competent oculist, rather than to wait until the child is old enough to read before having his eyes properly examined. We find to our sorrow that many do not come for examination until they are older, when it is really too late to do very much.

Definition of Blindness

The definition of blindness is a rather obscure thing. The topic on the program is "Conservation of Vision," which, otherwise, may be stated as prevention of blindness. Blindness is after all only a comparative thing. Our definition at present is that any child who has less than 20/200 vision in the better eye is potentially blind. There are many deviations from this and yet figures that

* Presented at the annual meeting, Ohio State Nurses' Association, Columbus, O., May 8, 1936, and reprinted with some revisions from *Ohio Nurses Review*, Vol. IX, No. 4, October, 1936.

we obtain by the usual Snellen tests do, from a practical standpoint, constitute the best definition that we have for blindness.

Periodic Examinations

I want to speak particularly about what can be done to preserve or conserve vision from birth up until school age because this is a very important period. We have advocated programs for periodic health examinations for adults. It seems to me that there should be some effort made to have periodic eye examinations or, at least, one examination before a child reaches school age. Fortunately, most children have normal eyes and need no treatment. An examination of their eyes will happily show this; but many may show a degree of blindness in one or both eyes of which the parents have had no knowledge. In many of these cases the parents are surprised to discover on examination that the children have defective vision, which, if given early attention, may be improved. Sometimes, of course, nothing can be done, but it is a source of satisfaction to know that every opportunity has been provided for their care.

It is the duty of those interested in the conservation of vision and in the prevention of blindness to lend aid and give advice that will help children to be brought up in the world with normally functioning eyes. The axiom that "an ounce of prevention is worth a pound of cure" applies very appropriately to this type of program.

Sad to say, there is often no attention paid to the child's vision until he has reached school age, when the teacher may discover that he has defective vision, while through all these years the parents, or those to whom the child is entrusted, have never suspected that he had defective vision. It is surprising that parents will say, "Well, I never knew you could examine a child's eyes before he could read the letters." Of course, this false impression in the minds of many should be corrected. The time to begin the prevention of blindness program may even be before birth.

Hereditary Eye Diseases

We have hereditary anomalies, such as albinism, retinitis pigmentosa, dislocated lens, congenital cataracts and various other

anatomical defects. Instances of these anomalies may occur many times in a single generation and they have a definite tendency to be inherited. We have no laws to prevent marriage of these individuals, nor have we laws to permit sterilization or birth control. However, I have found that by proper advice and explanation to them of the cause of their blindness they will in their own way avoid having children. At present this is, I think, the only way to be of service in preventing the increase in the large percentage of blind that we have in the schools for the blind from congenital or hereditary causes.

Statistics have shown, in the last census that was taken, that 45 to 50 per cent of children in schools for the blind are there because of some form of hereditary disease. This percentage has increased in proportion to the decrease in the blindness due to some other types of disease. Another serious factor that we meet with in children particularly, and often in the early adult, is congenital syphilis. Very often apparently normal children go through many years of life without any ocular defect whatever and, suddenly, even in the later years, develop inflammation of the eye, which we recognize and diagnose as interstitial keratitis. This disease is due to congenital syphilis and the child is a sufferer through no fault of his own. It has been found that proper and prompt treatment of the mother for syphilis during pregnancy has done a great deal to lessen the incidence of interstitial keratitis or other ocular diseases.

We also are forced to believe that the proper treatment of children who have other signs of congenital lues, or who are born to parents who have the disease, is imperative. I think that available statistics will show that of those children of luetic parents that have been treated, very few develop interstitial keratitis. After the disease has made its appearance, it seems that anti-luetic treatment does little to lessen the severity of its course. We know that it usually begins in one eye, but in spite of all treatment, the other eye will also be affected.

One of the most unsatisfactory experiences in the treatment of these cases is due to the fact that frequently the parents become discouraged with the progress, or lack of it, and frantically change from one doctor to another. To avoid this experience, as soon as

the diagnosis is made, the cause should be carefully explained to the parents. They must also be advised as to the probable course and duration of the symptoms and that the other eye will become involved in spite of all treatment. In this way, better co-operation will be given and the best results obtained.

Ophthalmia Neonatorum

I am not going to dwell very much on the subject of ophthalmia neonatorum. It is a source of much satisfaction to see that after the general adoption of Credé's method of prophylaxis, the education of the laity, and the establishment of better methods for treatment of these cases in the early stages, we have had fewer and fewer cases of ophthalmia neonatorum come to the schools for the blind. However, our set-up is not ideal and we still have many cases that come from outlying portions of the state in which the case has not been reported early nor received early care. This has been due particularly to the fact that we have no place to send them, for no hospital will furnish free this expensive type of treatment. Through the efforts of the Ohio Commission for the Blind, we have, to a certain extent, been able to get proper treatment for these cases when they were reported. Blindness from this cause is preventable if prompt and efficient treatment is provided. From the standpoint of prophylaxis, the Credé method, with which you are all familiar, is almost infallible; but in spite of this prophylactic treatment, we do occasionally find cases of ophthalmia neonatorum occurring. These are probably due to faulty technique. Some cases have been reported in which the improper solution has been used, such as the accidental use of 10 per cent of silver nitrate instead of one per cent. However, if the technique is properly carried out in this prophylaxis, and if the immediate and proper treatment can be provided, ophthalmia neonatorum as a cause of blindness will be unheard of.

When to Take Preventive Measures

If the child has fortunately escaped having any inflammatory or other outwardly evident disease of the eye during infancy, are we through with our responsibility? Can we neglect the child's eyes until he gets to school where the teacher, the physician or nurse in

charge of examination of the children, will discover that there is some defect of vision? As I said before, I believe that all along the line any possible abnormality or complaint of the child should be investigated by an oculist because the prevention program begins when the complaint begins.

Most diseases in children, of course, are manifested and are easily seen but many ocular defects are not recognized; the child may go on with defective vision without any particular notice being drawn to it by the parents or by anyone with whom he may be in contact. We do not say that every child must have his eyes examined but I do not think we are in error in saying that it is an advisable procedure. Some parents do this and it is a source of much satisfaction to them, after examination, to know that their children have healthy eyes, that they have no great refractive error and are starting through life without any ocular handicap. Other parents may be made unhappy by the fact that something unfavorable is discovered regarding the eyes, of which they were not aware but which might have been worse if neglected.

Ocular Defects Unaccompanied by Outward Signs

Briefly, what are these ocular defects that we may find? First of all, without any outward appearance of any defect, we may discover refractive errors, the commonest of which is farsightedness. Farsightedness, if great, means a very short eyeball in which, no matter how much the child attempts to strain, a clear picture cannot be obtained on the retina. Consequently, everything seen is blurred.

When a child is born, the only visual ability his eyes have is, perhaps, to see light. Then, as the child grows a little older, he will see moving objects. A little later he will be able to recognize his parents and to distinguish them, perhaps, from someone whom he does not know. Gradually, through a period of months and years, the child develops what we understand as normal acuity of vision. If children have refractive ocular defects, such as farsightedness, in which, no matter how hard they try, they are unable to get a clear picture, then the proper function of the retina has failed to develop.

The same thing takes place in the eye of a child who has a uni-

lateral squint or cross-eye. The eye which is straight is the only eye which is used. The opposite eye being deviated in another direction, the image in it is disregarded; consequently, the function of that retina will not be properly developed. We call this amblyopia ex anopsia which means blindness from disuse. Many children with very farsighted eyes do not have a squint but are never able to get a clear image on the retina and, as a result, never develop good visual acuity. These children, if the condition is discovered early, will be enabled by the use of glasses to get a clear image and thus can develop normal acuity of vision. If this is neglected for a period of years—even until school life begins—then we have lost valuable time and the vision rarely develops to a normal acuity, even after the prescribing of glasses. The same thing applies to those cases of squint in which the deviating eye is never used although it could have been used if it had been taken care of early enough in life.

Now who should take care of these children? Many of the ocular conditions that we find may be related to some other medical condition, and the oculist will be able to interpret these and to correlate one with the other. The thorough knowledge of embryology which only the doctor has had in his medical school work, enables him to understand the congenital anomalies that we meet. The medical eye man (oculist) is interested in more than the selling of glasses and it would be, I believe, the practice of the medical eye man to avoid putting glasses on any child before school age, or at any time, unless he felt that the refractive error was great enough to warrant it and that glasses were going to accomplish the purpose for which they are intended. We have found a great many children who are wearing glasses needlessly. Glasses have been prescribed for many children who have come to the school for the blind with conditions in which glasses will not help at all but are the only instrument at the command of the man who does that type of eye examination.

The advantage of the use of drops, such as atropine or other cycloplegics to paralyze the ciliary muscle, the muscle of accommodation, is recognized particularly in children. We cannot do a satisfactory examination in a child without the use of drops, in spite of the propaganda to the contrary on the part of those individuals who are not permitted to use them.

Correct Age for Glasses in Childhood

A child is never too young to wear glasses if he is very farsighted or nearsighted to a degree which requires the glasses to enable it to get a clear image on the retina. If glasses are not worn in these extreme cases, the visual acuity does not develop. For example, the youngest child on whom I ever put glasses was ten months old and had a hyperopia of about six diopters. If that child had not early learned to see through his glasses, the visual acuity would not have developed, although there were no anatomical and no pathological changes in those eyes. The mother shortly discovered that the child would cry unless he had his glasses on. Of course, we do not prescribe glasses for such young patients unless there are very high refractive errors which, if uncorrected, would prevent the development of normal visual function.

The nursing profession can help to correct the false impression of parents and the laity that it is dangerous to have children wear glasses. Many people are impressed with the idea that if they play ball or other outdoor games, they may fall and break their glasses and have the glass go in the eye. I have never seen a child have his eyes injured from wearing glasses, but I have seen a good many children who, if they had worn glasses, would not have had the ocular injuries from which they suffered. Glasses are made sturdy enough for these children and if they really need them, there is no reason why the parents should fear that the glass will be broken and hurt their eyes. Any force which will break a glass by impact, will do far more damage to the eye if the glass is not there to serve as a protection. Goggles are worn to protect the eyes in industry, so why should they not furnish the same protection to the child?

Cross-Eyes

Of course, every child that has a deviating eye which we call a squint or strabismus, no matter how young, should begin to receive treatment immediately after the condition is noted. The treatment should be different for every type of squint. The competent oculist should be able to manage the case from its very incipiency on through perhaps several years and bring about what we understand as a cure. Neglected cases grow up with a blind,

useless eye which turns in; and with this cosmetic defect, the child's development in his contacts with others is bound to be affected: this may make him backward or make him rebellious. I know one little fellow who wants to fight every time anyone says anything to him about his eye. Others have the opposite temperament and are backward. I believe it is wrong to allow these children with deviating eyes to enter school where they will be subject to the ridicule of their playmates. The old idea was to let the squint go until the child grew older and then straighten the eye by glasses or surgery. A few types of squint can be corrected with glasses, but if the glasses do not immediately—or within a period of a few months—straighten the eyes and allow both eyes to be used together, they are not the only thing that is indicated. It is true that they are needed in a large percentage of cases. Whether there shall be an operation or whether there shall be a systematized form of exercise, will depend upon the particular type of case; but it is wrong to allow the child to go to school and mingle with others if the condition can be corrected by any of the means, including surgery, which can be used a considerable time before school age.

Congenital Cataracts

Just a word in regard to congenital cataracts, of which there is so much dispute. A congenital cataract is due to an opacity of the lens of the eye which has been influenced in its development some time during pregnancy. It has hereditary and familial characteristics but we do have cases appearing spontaneously and, usually, in both eyes. It is recognized, of course, in most cases by the appearance of a white pupil in a child, and a rather searching movement of the eye. The searching movement is an attempt of the child to see through the cataract which produces a fog and, as a result, good clear vision cannot be developed. After these movements have been established and the child has been handicapped by inability to see, the movements will continue. It is then too late to expect a good visual result from a cataract operation, even with a perfect surgical result. Congenital cataract should be operated as soon as the child is in good enough health to stand a very minor operation under general anesthesia. In this way, if we can get a good

clear pupil and allow the rays of light to enter through it with the aid of a correcting lens, the child theoretically should develop as good vision as any other child.

Sometimes there may be other defects in the eye associated with congenital cataract, such as a small, undeveloped eye, the microphthalmic eye, which, in the presence of a cataract, offers a fair prognosis for some vision if operated early. If they are not taken care of, the child will be totally blind and will not be able to even help himself around. We have several children in the schools for the blind who were operated on in infancy with this condition. They are still in the schools for the blind. Their vision is very markedly impaired but they are happy and able to get around, which they would not have been had they not had surgical attention.

Congenital cataracts neglected until late will develop the ocular nystagmus which I mentioned. There may be a successful operation but since the ocular nystagmus has developed, the visual function may not be as good as the successful operation might indicate.

Conclusion—Results of Neglect

I want to leave the message with you that every child has a right to have good ocular attention before he is old enough to request it for himself. A great many boys and girls have gone through high school, or even through college, without proper attention because their parents would not permit any surgery upon their eyes for the correction of squint. These young adults are then thrust on the cruel world with a terrific handicap and an inferiority complex. It is a pitiable condition in which some of them find themselves. Many want to have their eyes straightened so that they can go out and compete with others and carry on in the world. A person should never be forced to go through life, particularly in the school age, with that defect, any more than he should with a cleft palate or a harelip. Great things can be accomplished in this line if the patient is placed in the hands of the interested oculist who can properly take care of him, whether it be by refraction, exercises or by operation. For this reason we believe that the program for the prevention of blindness should be in the hands of someone who has the privilege and the right to prescribe medically or surgically for the patient.

Progress in the Use and Application of Photo-electric Cell Control*

Aksel J. C. Knudstrup

THE use of the photo-electric cell in controlling lighting in schoolrooms is an innovation which promises much practical application

Study of Natural Lighting in Classrooms

A GREAT deal of research work has been made on natural lighting and the difference in intensities of lighting in the typical classroom. The most exhaustive study is probably that of A. F. Beal of the United States Public Health Service,[1] the study made by H. H. Higbie at the University of Michigan,[2] and the study by James E. Ives and Frederick L. Knowles of the United States Public Health Service.[3]

If we refer to the results of the study made by Mr. Beal, we will find that the inside-outside illumination ratio is not constant but varies with the season, the hour of the day and the condition of cloudiness.

From the study by Professor Higbie on a model classroom, the variation of the lighting in the classroom proper, due to the natural illumination from windows on one side of the room, is shown to decrease very rapidly as the distance from the window increases.

From the study by Mr. Ives and Mr. Knowles it can be seen that the average sky-brightness of the clear north sky from 8:00 A.M. to

* Presented before the Thirtieth Annual Convention of the Illuminating Engineering Society, Buffalo, N. Y., August 31 to September 3, 1936.

[1] Beal, A. F.: *Studies in Natural Illumination in School Rooms*. Public Health Bulletin No. 188.

[2] Higbie, H. H.: Treating the Windows to Conserve Daylight, *Transactions of the Illuminating Engineering Society*, March, 1929.

[3] Ives, James E., Knowles, Frederick L., and Thompson, Lewis R.: *Studies in Illumination*. Public Health Bulletin No. 218.

4:00 P.M. varies from 219 candles per square foot in January to 550 candles per square foot in June. On cloudy days the average sky-brightness will naturally be very much less, the ratio, however, remaining the same.

It is readily apparent from the foregoing paragraphs that some sort of control of lighting should be made to compensate for these variations in natural lighting and the effect on the daylight illumination of the classroom. The photo-electric cell is the best control known at the present time to accomplish this.

Example of Control in Classrooms with Windows on One Side

Let us take for a concrete example a typical classroom with windows on one side controlled by means of the photo-electric cell. Let us assume that the photo-electric cell is set to turn on at 15 foot-candles and off at 45 foot-candles and that the illumination provided by the artificial lighting is 15 foot-candles. Then if the intensity should drop to 14 foot-candles, the light would turn on giving 29 foot-candles, and if the intensity went to 46 foot-candles the light would go off and the resultant illumination would be 31 foot-candles. Thus the intensity of illumination would always be kept above 15 foot-candles at the side of the room away from the windows and at the same time a more uniform illumination would be provided over the entire room.

An improved control to obtain constant lighting can be attained by controlling the inner and outer row of lights by two separate cells. The importance of controlling the inner row of lights on a separate cell and relay is readily apparent from the results obtained in the tests made by Professor Higbie on a model classroom. Taking as an example a classroom 20 feet deep and 30 feet long (parallel to the windows), the illumination drops off 81 per cent at a distance of 20 feet back in the room away from the windows, 52.3 per cent 10 feet back from the windows and 34.8 per cent 8 feet back from the windows. Thus if 15 foot-candles were provided for by means of the artificial illumination and 15 foot-candles of illumination were obtained 5 feet from the windows, only 2.85 foot-candles would be provided by natural illumination 20 feet from the windows, 7.15 foot-candles 10 feet from the windows and 9.8 foot-candles 8 feet from the windows. Now when the photo-electric

cell turned on the inner row of lights, a little over 15 foot-candles would be obtained over the entire room. To substantiate this hypothesis, tests were conducted in the Washington, D. C., schools and, to all practical purposes, the results proved the hypothesis to be correct. Furthermore, the results obtained by Professor Higbie in a model classroom were proven to be practically true in an actual classroom.

Tests Conducted at Henry School, Washington, D. C.

A study has also been made in the sight-saving classrooms of the Henry School in Washington, D. C., on methods of control. In these experiments it was found that in classrooms with windows on the north and east sides of the room the best control was had by placing the photo-electric cell about 7 feet from the floor on the west wall, 10 feet from the south wall. It was found that at this point the average illumination was most satisfactorily maintained constant throughout the entire room.

In this case the photo-electric cell relay was set to turn on the artificial illumination when the natural illumination fell below 10 foot-candles and to turn off the lights when the combined natural and artificial illumination reached 30 foot-candles. The artificial lighting provided for an illumination of 15 foot-candles.

The instructor of the sight-saving class states that since the photo-electric cell control has been installed in her room the results have been remarkable. She states that the ease of teaching has been increased materially, the students seem better satisfied and are more eager for knowledge. The natural result of the control of illumination by the photo-electric cell is the protection of the eyesight of the student.

Control by One Photo-electric Cell for All the Rooms on One Side of the Building

Also it is often possible to control the illumination on one whole side of the building with a single photo-electric cell. To do this the rooms must have the window exposures and areas and the shape and size of the rooms similar. Furthermore, the natural and artificial lighting conditions should be the same. When controlling a group of rooms by this method the cell should be placed where it will receive the best average light.

Summary

In conclusion, it can readily be seen that the control of artificial lighting by means of the photo-electric cell has many applications which certainly are beneficial to the student as well as the teacher. These benefits may be placed under the following headings:

1. Maintenance of more constant illumination in the classroom.
2. Maintenance of sufficient illumination in the classroom.
3. No classroom distractions due to teacher's having to turn on and off the lights.
4. Maintenance of a more even distribution of light in the classroom.

The value of these benefits is apparent to every illuminating engineer as they are fundamentals of better lighting.

In regard to the methods of control, it is apparent that where two sides of the classroom have window exposures the photo-electric cell can best be utilized by controlling all the lighting units at one time. On the other hand, with window exposures on one side only, the best and most economical results may be obtained by controlling rows of luminaires parallel to the inside wall. The controlling cell for the inside row of luminaires should be on the center of the wall, 8 feet from the floor. The controlling cell for the outside row of luminaires should be suspended from the ceiling, 8 feet from the floor in the center of the room. To have one control for an entire side of a building, the controlling cell should be placed on the lower floor, or, in other words, the light collector cell should be placed where it will receive the best average light. It is also possible in groups of rooms with the same natural lighting conditions to control them by one cell. These rooms may be selected by using a light meter to determine which rooms have the same amount of natural light at identical times. In this case, measurements should be taken on the dark side of the rooms.

Editorial

National Social Hygiene Day

ON February 3, 1937, concerted action, sponsored by the American Social Hygiene Association and many co-operating agencies, in approximately 100 communities throughout the United States, will bring to public attention two of society's greatest enemies: diseases which leave in their wake blind, deaf, crippled or otherwise disabled human beings. For years these diseases have been linked as venereal, but doctors know them as the communicable diseases, syphilis and gonorrhea.

Nearly 30 years ago, the National Society for the Prevention of Blindness began a war against ophthalmia neonatorum (babies' sore eyes)—a disease causing blindness to the newborn, through the presence of germs in the birth canal of the mother. Although the use of prophylactic drops at birth was known to be an almost infallible preventive, it was not until their use was made mandatory that the incidence of blindness caused by ophthalmia neonatorum began to drop, until now it has been reduced more than 75 per cent.

Today the National Society for the Prevention of Blindness feels that the problem of blindness or damage to vision from syphilis must be attacked with the same concerted vigor that resulted in the phenomenal reduction of ophthalmia neonatorum. It is an established fact that prospective mothers who have syphilis can bear healthy children if prenatal antisyphilitic treatment is administered in time. A blood test is the universal method of determining the presence of syphilitic germs. The Society therefore joins all interested agencies in sponsoring measures which make it mandatory for routine blood tests to be made on all expectant mothers by their physicians—whether they be private or clinic patients. By discovering, and following up with treatment, all syphilitic expectant mothers, we may hope for a marked decrease not only in blindness and defective vision but in human misery and wretchedness, if not utter tragedy.

In view of the close relationship between prevention of blindness and the campaign to "stamp out syphilis," we urge our readers to support National Social Hygiene Day and subsequent efforts to reduce the toll of suffering caused by this disease.

The Forum

THIS section is reserved for brief or informal papers, discussions, questions and answers, and occasional pertinent quotations from other publications. We offer to publish letters or excerpts of general interest, assuming no responsibility for the opinions expressed therein. Individual questions are turned over to consultants in the particular field. Every communication must contain the writer's name and address, but these are omitted on request

What the Community Should Know About Failing Vision*

Immutable, unrelenting time leaves its marks on the human body as it does on all other living things.

When the average person reaches the age of forty, a change takes place in his eyes; a dislike to do near work, a late afternoon or early morning headache, a tendency to hold small objects farther away, and occasionally blurred vision. Correctly fitted glasses permit close application with clear sight and without discomfort. The testing for glasses is a highly technical art and the one prescribing lenses must also be competent to render an opinion on the general health of the patient.

A complete examination includes the study of the background of the eye, the stage upon which many of the tragedies of life are enacted. It is now possible to make a photographic record which is of extreme value, for by it the past, the present, and the future ocular health can be told.

If a patient has to change his glasses frequently, it is an indication of either a constitutional or a local eye disease and calls for a searching investigation.

Widely heralded special forms of glasses have an extremely limited range of usefulness. Telescopic lenses and contact glasses are for rare conditions and will never take the place of properly fitted spectacles.

One frequent cause of failing vision is cataract. This is a clouding of the lens of the eye and may be of an isolated part, slowly progress, start and stop, or rapidly involve the entire structure. Babies may be born with cataracts and children may develop them during

* Reprinted, with permission, from the *New York State Journal of Medicine*, September 15, 1936.

the course of their growth, especially when undernourished. Some cataracts mature in a very short time, as for instance in diabetes and goiter. Others follow the ingestion of dinitrophenol, a drug which has an unwarranted reputation as a safe cure for obesity.

In some families cataracts appear early in life; in others, late. If the sight is poor, the cataract can be removed. After the operation serviceable vision is usually restored. The majority of those who have cataracts wear proper glasses and live without fear or apprehension of the future.

By means of a special instrument, the slitlamp, it is possible to tell whether a cataract will grow rapidly or change so slowly that for years there may be scarcely any perceptible advance. I would be derelict in my duty if I failed to have you understand that no form of medical treatment has ever changed the course of a senile cataract, no drug, no serum—nothing.

Glaucoma is a hardening of the eyeball. It is of such sinister force and such wide distribution that everyone should know about its manifestations. In one form there is redness of the eye, accompanied by sudden loss of sight, pain, nausea, vomiting and the symptoms of a gastro-intestinal upset. If seen early and an operation properly performed, sight is frequently recovered.

The other type is unaccompanied by redness or pain but, like a thief in the night, it steals sight by gradual encroachment on the field until only the central vision remains. It is one of the most perplexing of eye diseases and calls for the best in ophthalmoscopic diagnosis and therapeutic skill. If patients are placed under treatment before the field of vision—the ability to see about—is much reduced, glaucoma can be checked.

When a patient has transitory attacks of blurred vision, he should immediately consult an eye specialist.

High blood-pressure is an example of foreordination or predestination, for heredity plays the principal rôle in its production, onset, and course. One form is, however, preventable: that which develops in the course of pregnancy. The ophthalmologist is the one most competent to advise when the fetus should be removed, for he is able to recognize the premonitory signs of approaching disaster. High blood-pressure is often diagnosed by the ophthalmologist in his routine examination of the eyes.

If we admit that man is as old as his arteries, then heredity and his physical and mental condition determine the time when poor vision will result from circulatory disease. A particular type of arteriosclerosis involves the minute blood-vessels which supply the center of sight. Those afflicted are unable to read but they can see things about them and never go blind.

Pernicious habits produce poor sight. The nearsighted child who persists in reading in the dark corners of a room, the patient who uses alcohol or tobacco to excess, and the fair one who wishes to remove superfluous hair by drugs, are all drifting on a treacherous sea where the uncharted rocks which lead to blindness are hidden from view.

Hereditary tendencies express themselves in many ways. Some can be helped if discovered early and correctly treated; others can be retarded, but in a few nothing can be done to postpone the advancing darkness.

Poor vision may be the effect of occupation.

The retina, the seeing layer of the eye, may be separated from its base either by growth beneath it, progressive nearsightedness, or a blow on the eye. The patient becomes conscious that a portion of his field of vision is absent or that a floating cloud partially covers his sight. If the detachment is the result of a tumor, the eye must be removed. If it is the result of a stretching or a tearing of the retina, it is susceptible to treatment by the use of special electric currents.

General diseases cause poor sight. In scarlet fever the patient may have kidney complications which will cause retinal disease. In diphtheria there may be a temporary paralysis of the focusing muscle, making reading impossible; in diabetes, there may be hemorrhage, an instability of the focusing power, and a curious optic nerve affection which causes marked reduction in central vision. In tuberculosis of the bones and general body structures there may be an actual destruction of parts of the eye. Pulmonary tuberculosis, however, rarely causes a severe eye lesion. Syphilis, in both the inherited and acquired types, causes failing vision. Brain tumor is often first discovered by the eye specialist.

Prolonged close application is best performed under correct illumination. Campaigns for better lighting are most heartily endorsed, but we cannot sanction the too enthusiastic statements that such measures will eliminate either the need for spectacles or reduce the incidence of eye disease.

And, finally, to the disciples of health, the advocates of physical fitness and the guardian of both, the physician, I urge an aggressive campaign for the prevention of ocular disease by its early recognition and efficient treatment, with an urgent insistence that those who need glasses wear them to preserve their sight.

I leave a word of cheer to those with cataract, a message of hope to those with glaucoma, and an admonition of caution to those predisposed to circulatory diseases.

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Play Activities for the Visually Handicapped Child

Although the physical education program in the schools is a comparatively new contribution to the curriculum, its value to the growing child has long been recognized. While its purpose in the beginning was to provide the child with periodic exercise, the philosophy grew that a well rounded program of physical education should develop musculature, and also certain habits and attitudes not only in regard to activity but in social relationships as well. It should provide a basis or a background upon which to build a worthwhile structure of leisure time activities. We are all familiar with the joy that the orthopedically handicapped child takes in physical recreation no matter how simplified it may be. We have seen the baseball teams which consist of twenty members rather than the usual nine, some of whom can run, some of whom can bat, some of whom can catch, all co-operating in a group venture and all building toward social organization and adaptation.

The so-called normal children present very definite individual needs and capacities. There will be a range in the average physical education class from the child with poor co-ordinations, flabby musculature, apathetic attitude and who is passive in the extreme toward social activities, to the child who is well muscled, finely co-ordinated, possessor of an excellent sense of timing, a knowledge and an interest in both individual and group activities and, if anything, too aggressive in his social reactions. The physical education program can be adapted in the average school that has indoor and outdoor facilities to meet the needs of all the children in the school, whether they need vigorous, modified or restricted activity. There should be opportunity for participation in physical education instruction and in play for every child in the school. There should be corrective work for those who would profit by it and a higher type of competition for those whose physical condition warrants it. This program in the average school should be developed through a close co-operation between physical education teachers, the school physician and the nurse, for it is in this way that the people responsible for the service and supervision of the health program can exchange views and correlate their efforts. Where there are youngsters in the school who have handicaps, their program in the academic curriculum is often subject to alterations and adaptations, and the same should be true of the physical education program. It has been recognized that adaptations in academic work were not only possible, but advisable, and too often no thought was given to the need for continuing physical activity. This can be readily un-

derstood in places where the program is limited or where the instructor has not had recommendations made for a restricted or modified program.

While it is necessary in many cases, because of the greater opportunity afforded, to list partially seeing children in a special class, it is essential that these children be segregated only in that part of their program requiring close eye work. It would seem that segregation is not only justifiable, but to be highly recommended when the child may profit more through the opportunities which should be inherent in the smaller and more homogeneous group. However, in cases where the child can adapt with facility to the larger and more heterogeneous class situation, he should participate with others in social activities. This is true not only of physical education and recreation, but music and other activities as well. There are certain prerequisites to such a plan, for, if a physical education teacher is available, the needs of the child with visual handicaps should be fully explained, their capacities outlined, and cautions stated. The physician or the specialist should make the recommendation for the participation in physical education activities and he, in turn, should understand what the possibilities of such a program may be. One child may be able to take part in all phases of the physical education program, whether it be rhythms, dancing, stunts and tumbling, games or sports, while another child may be limited to those comparatively unexciting low organization activities with more or less stereotyped floor patterns and very little in the way of vigorous muscular exercise. This, of course, would depend upon the condition of the child, the prognosis of his difficulty and the recommendation of the physician in charge.

One of the first responsibilities in the education of any child who is handicapped is to assist the child in the acceptance of and the adjustment to his particular handicap. His assets must be encouraged and developed in order that his liabilities may be met without hazard. If this is done, the child will more clearly understand the extent of his handicap without developing an anxiety in regard to it. This makes for a much better program because of understanding on the part of both the teacher and the pupil.

The chief difficulty that the classroom teacher would meet in program planning for a group which would include one or more children with visual difficulties would be her lack of knowledge of activities. Her lack would be not in understanding, but in materials. Some play activities can be used for the normal and the handicapped without adaptation; some may require a recognition of the importance of such details as length of the playing area,

type of equipment used and other similar mechanical factors. There are many activities, of course, which it would be necessary to revise completely, but this, if carefully done, need not detract from the interest of any of the children for the activity. For those children who have greatly restricted vision, some dances with great freedom of movement and wide range of floor pattern might not be desirable. However, there are many of the traditional rhythmic activities with a more or less stereotyped floor pattern so that the child may have a feeling of confidence and hence a freedom of movement.

A teacher who knows and loves children will readily see the need for physical recreation. The physical education teacher must learn from the sight-saving class teacher the guideposts that are a part of the sight-saving philosophy. The classroom teacher could gain from the physical education teacher a knowledge of techniques and materials that would enable her to carry out the daily need for recreation. Not only would the teachers profit through such an association, but the child with a handicap would have open to him new activities, new interests, new fields to conquer.

Ruth Abernathy
Albany, New York

Throw Away Your Glasses*

The history of quackery constitutes one of the most curious chapters in the records of humanity. The outstanding facts appear to be that the world is never without a goodly sprinkling of clever impostors, persons who are brilliantly successful in misleading others for a pecuniary reward; and, on the other hand, that a very large percentage of the human race is at all times ready and even eager to be fooled.

It is now almost a daily occurrence for the eye physician to be asked by patients what he thinks about "eye exercises." Knowing that this expression belongs chiefly to the vocabulary of the professional quack, the oculist's reply to such inquiries is likely to be rather explosively vigorous or contemptuous, and perhaps not sufficiently explanatory. Most of us are so sure of our own ground, so intimately conscious of ocular structure and optical principle, that we hardly give sufficient consideration to the perplexity of the patient who has heard of this or that alleged wonderful cure.

How many of us have had curiosity and patience to acquire and read the arguments of the professional eye exercisers? An enterprising colleague recently handed the present writer a volume printed in England and published by an Ameri-

* An editorial, reprinted, with permission, from the *American Journal of Ophthalmology*, August, 1936.

can firm under the title *The Improvement of Sight by Natural Methods.* The author is one C. S. Price, M.B.E., who describes himself as "Late Captain Australian Army Medical Corps, Principal of the School of Eyesight Training (London), Director of the Radionic Therapy Centre (London)," and who in the subtitle claims for his book that it is "A complete treatise upon the newer methods of treating all conditions of imperfect sight by natural means, and obviating the necessity for glasses, drugs, or operations."

Price evidently wishes to be regarded as highly respectable, and he makes occasional polite bows to the regular medical profession. His book "does not purport to be a treatise upon optics, nor should it be interpreted with undue criticism of orthodox methods." It gives "the actual principles and practice of the methods of Eyesight Training applied with such outstanding success for many years by the author . . . its instruction may be followed in all cases with perfect safety. . . no book can adequately take the place of a qualified personal instructor, who alone can diagnose and synthesize for each individual case." Price acknowledges himself the not too slavish disciple of "the late revered Dr. W. H. Bates, M.D."

On what new and startling basis does the author undertake to remove optical defects? Price's presentation is singularly lacking in any revolutionary statement as to the fundamentals of ocular anatomy. In fact, he has apparently delved deeply into a number of standard textbooks on the eye, and under such headings as "Short Sight," "Long Sight and Astigmatism," and "Squint" he follows for the most part quite ordinary lines. Under "Simple Physiology of the Eye" he mentions three theories: that of Helmholtz, that of Tscherning, and that of Bates (!), "who maintains that the ciliary muscle plays little or no part in accommodation, the adjustment being brought about solely by the action of the extrinsic muscles on the whole eyeball and not on the lens specifically." But Price carefully avoids controversy on this subject.

His actual heresies include statements that the "orthodox oculist," in using lenses and optical apparatus, "endeavors to cure one kind of strain by adding another"; that glasses maintain the error which they seek to correct, and that the exercises which he advocates restore normal focus. All such statements are categorically made, without any attempt at logical proof.

What are the therapeutic measures recommended, the so-called exercises which are to do away with the need for glasses? Essentially, they resolve themselves into a great variety of maneuvers, some ludicrous but many obvious and quite lacking in mystery, to produce relaxation of the eyes.

For example, if when tired of reading you have covered your eyes

with your hands, you have (probably without knowing it) performed one of the classical "exercises" for "the improvement of sight by natural methods." This is practically what Bates and his disciples would call by the fancy title of "palming." Quite a fundamental maneuver, apparently, is the "re-establishment of normal blinking." "Flashing" is the process of regarding an object for three seconds only and then closing the eyes. "Shifting" is moving the focus from one point to another and avoiding a fixed stare. "Alternate focus" on near and distant objects is recommended, with each eye separately or both together.

"Dr. Bates," we are told, "wrote that central fixation was lost in all cases of abnormal conditions of the eyes, whether functional or organic." So you are to practice "central fixation," because "when an eye is suffering any refractive error of focus . . . the image is focused irregularly and over a larger area, with the result that many of the nerve ends of less sensitiveness, lying outside the macular area, . . . are taxed with a stimulus beyond their capacity, and the result is obviously a strain." The exercises proposed for restoring "central fixation" are quite childish and futile. One of them is to look repeatedly for a second at one of a group of large letters at its remote limit of visibility, closing the eyes in the intervals, "until you feel you can ignore the other letters." Another is to read through a circular hole in a card which is carried across the printed page. Another is "to examine the small spaces inside the letters of ordinary reading type."

"Methods of relaxation" include Bates' "palming" and "swinging." A good deal of nonsensical detail is given as to the precise technique of "palming," but practically it amounts to nothing more than resting the eyes by covering them while relaxing the mind. "Swinging" or "swaying" is little more than rhythmic turning of the body from side to side with the eyes closed.

The chapter on "Exercises in Visual Co-ordination" includes a series of tongue twisters such as our old friend, "Round the rugged rocks the ragged rascals ran." The chapter on "Visual Illusions" reproduces a series of familiar diagrams, study of which by the patient is supposed to stimulate the ability to change focus at will.

Most of the material in Price's book serves as bait, of relatively harmless appearance, for attracting the reader to the author's "clinic." But here and there he indulges in claims which go beyond the idea of throwing away your glasses, and which can only be described as criminally and inhumanly dishonest. His special methods are applied to "diseased eyes and blindness." "Swaying" exercises are used in cases of glaucoma, in which "considerable relief and improvement are possible along the lines indicated in . . . this book." In nystagmus he claims "most ex-

cellent and permanent results . . . by . . . palming, swaying," and other exercises. For amblyopia "the general principles of eyesight training advocated . . . will invariably prove completely successful even in the worst cases." ". . . practice of the principles of macular vision will, in most cases, be . . . successful in . . . reestablishing the colour sense." A special chapter is devoted to "Blind and Incurables." "Such cases as can and have actually been benefited, include . . . ophthalmia neonatorum . . . retinal detachments, as well as many post-operative cases of glaucoma, cataract and associated conditions."

After reading Price's volume, one wonders what it is all about, and the answer is that any excuse will serve to encourage omission of glasses by those who need them but are prejudiced against their use. The colleague referred to early in this editorial suggests that he who undertakes to advise in matters of health should possess three qualities: namely, natural intelligence, education and honesty. Those whom we regard as quacks may possess two of these qualities but not all three. The reader may form his own conclusions as to which of the triad of qualities is most lacking in Price's case.

The incontrovertible physical facts which utterly contradict the fantastic statements of Bates and his followers, including Price, are those of ocular structure and measurement and of physiologic optics.

A difference of one-fiftieth of an inch in length of the eyeball represents a very important difference in focus of parallel and other rays upon the retina. If, other things being equal, the eye is one-fiftieth of an inch too short, then the eye is roughly one-and-a-half diopters hyperopic or farsighted, and is subjected to the formidable amount of eyestrain that this refractive error involves. If, in relation to the refractive value of the ocular media, the eye is one-fiftieth of an inch too long, then the eye is approximately one-and-a-half diopters myopic, with a correspondingly pronounced defect of shortsightedness or myopia.

The ophthalmometric measurements of corneal astigmatism, constant from day to day and often from year to year, are irrefragable proofs that we are dealing with an organic defect of corneal curvature. The facts disclosed by the ophthalmoscope, retinoscope, and trial case may be less obvious and in part more complicated for the feeble or unwilling understandings of quacks and prejudiced patients; but they are none the less conclusive and irrefutable to the trained and intelligent mind. For people like Bates and Price to deny these facts is evidence of ignorance, obtuseness, or dishonesty, or sometimes of a combination of more than one of these mental and moral shortcomings.

W. H. Crisp, M.D.
Denver, Colo.

Note and Comment

National Society Notes.—Hundreds of workers in the movement to prevent blindness and conserve vision throughout the United States attended the three-day annual conference of the National Society for the Prevention of Blindness early in December, in Columbus, Ohio. The 44 speakers on the program included authorities from the professions of medicine, nursing, education, social welfare, safety engineering and related fields.

Most auspicious as an anticipatory event for the annual conference was the participation of Dr. Park Lewis, a vice president of the Society, in the nation-wide radio broadcast during the "We The People" hour on Sunday, November 29.

An enthusiastic audience attended the annual meeting of the Society, December 11, in the Russell Sage Foundation Building, at which Lena R. Waters, Director of the Department of Social Service at the Hospital of the University of Pennsylvania, was the chief speaker. Her subject was: "Social Interrelationships in Sight Conservation." Preceding Miss Waters was President William Fellowes Morgan, who reviewed the work of the year and voiced the hope of an ever-expanding program for the Society.

The Society is glad to announce that Mr. Lyman A. Bliss of New York, N. Y., and Dr. William Zentmayer, ophthalmologist of Philadelphia, Pa., have kindly accepted invitations to serve on the Board of Directors of this Society, succeeding the late John L. Wilkie and the late Dr. Thomas B. Holloway. It gives us pleasure also to announce that Dr. Mark Schoenberg has accepted the place left vacant on the Board of Editors of the SIGHT-SAVING REVIEW by the death of Dr. William H. Wilmer.

An article entitled "Lighting the Lamp of Learning," by Winifred Hathaway, associate director, will appear in a forthcoming issue of *Progressive Education*. Other articles by the staff include a series by Francia Baird Crocker, R.N., associate for nursing activities, in *Public Health Nursing* for January, February, and March, 1937, under the title, "A School Program for Eye Health." Reprints of this series, as well as of the article by Mrs. Hathaway, will be available upon request.

The development of local prevention of blindness movements has commanded the attention of Eleanor Brown Merrill, associate director. She has recently been called to Washington, D. C.; St. Louis, Mo., and Philadelphia, Pa., in connection with training of personnel for local and state programs.

In connection with various programs for integrating eye health in college training, Dr. Anette M. Phelan, staff associate in education, visited Kokomo, Ind.; Madison, Minneapolis and St. Cloud, Minn.; Columbus, Ohio, and Milwaukee, Wis.

Current Articles of Interest

The Problem of Eye Injuries, Constance G. Hartwell, M.D., and William D. Rowland, M.D., *New England Journal of Medicine,* August 13, 1936, published weekly by the Massachusetts Medical Society, Boston, Mass. The experience of the authors, given and illustrated by cases, indicates this summary and these conclusions: "When one is confronted with an eye injury, the following points should be borne in mind:

1. Immediate or early care, regardless of the extent of injury, is always advisable;
2. Careful and early surgical repair of torn lids will insure best function and fewer scars;
3. X-ray to complete a diagnosis and a giant magnet to remove deep foreign bodies are essential equipment in many cases;
4. Infection is usually apparent early and is introduced, with few exceptions, at the instant of penetrating wounds;
5. Consultation with an eye surgeon or among eye surgeons is sound practice;
6. Careful watching and efficient therapeutics are imperative if the injured eye is to be saved and sympathetic involvement of the fellow eye prevented or controlled."

The Year's Progress in Illumination, W. C. Brown, *Transactions of the Illuminating Engineering Society,* November, 1936, published monthly by the Illuminating Engineering Society, New York, N. Y. This detailed report covers the following topics: light sources; ultraviolet radiation; reflecting and transmitting materials; school lighting; office lighting; industrial lighting; store lighting; luminous buildings; exposition lighting; home lighting; farm lighting; street and highway lighting; motor vehicle lighting; railroad lighting; airplane lighting; miscellaneous new devices, controls, etc., and natural lighting.

Lighting at School and at Home, *Health Bulletin for Teachers,* Vol. VIII, No. 3, November, 1936, published by Metropolitan Life Insurance Company, School Health Bureau—Welfare Division, New York, N. Y. Principles of good lighting are discussed

and the advice given that, "to put the principles of adequate light without glare into effect requires constant adjustment to environment. The change from a sunny to a gloomy atmosphere, the position of the body and the work in relation to the light source, the light-absorbing character of the materials used, all have to be reckoned with. But if the principles of good lighting are adhered to, the normal eye will render good service without strain, and the abnormal eye may be assisted in carrying the seeing load."

A Study of the Reactions of Physically Normal, Blind, and Deaf Children to Questions in a Verbal Intelligence Test, B. F. Holland, Ph.D., *The Teachers Forum*, September, 1936, published monthly by the American Foundation for the Blind, Inc., New York, N. Y. The author's interpretation of the data obtained appeared to justify these inferences: "(a) that the similarities and differences revealed by the gross scores are not due altogether to the factor of intelligence; (b) that the chief differences between the physically normal and blind and the deaf are due to the language handicaps of the deaf; (c) that ability to react to abstract relations depends upon meaning accruing from a particular type of sensory data, though audition is the most important sensory avenue for the mastery of language; (d) that particular questions are difficult for all types of subjects when they are complicated in structure and when they contain words or ideas beyond the range of the experiences of the subjects; (e) that the blind children, especially those of the third grade, have greater capacity to attend to materials presented orally than do physically normal children; and (f) that deaf children are hampered in reacting to various situations by their unwillingness to attack problems without help."

Constitutional Considerations of Trachoma; and **The Constitutional Treatment of Trachoma,** Hans Schroeder, M.D., *The Eye, Ear, Nose and Throat Monthly*, July and September, 1936, published monthly by Professional Press, Inc., Chicago, Ill. In these two articles Dr. Schroeder discusses trachoma and its treatment in detail, and expresses the belief that "by supplying the body with the deficient substances, as mentioned in the treatment, trachoma can be controlled and eradicated—with sufficient attention to iodine and vitamin C supply to the organism."

Pupillary Variability in 108 Syphilitic Patients, Theodore M. Shapira, M.D., and F. M. Crage, M.D., *American Journal of Ophthalmology*, October, 1936, published monthly by the Ophthalmic Publishing Company, St. Louis, Mo. The following results of tabulation are given:

"In this series of 108 syphilitic patients, 32 patients had pupillary irregularity in both eyes; in 8 patients the pupils were irregular in one eye;

"Pupils were unequal in 42 patients;

"Pupils did not react to accommodation in 19 patients;

"Reaction to light was absent in 33 patients;

"Definite typical Argyll Robertson pupils were present in 17 patients;

"Five patients showed reflex pupillary rigidity;

"Considering a miotic pupil as being less than 2.5 mm., miosis was present in both eyes in 15 patients and in one eye in 16 patients."

A New Operation for Chronic Glaucoma: Restoration of Physiological Function by Opening Schlemm's Canal under Direct Magnified Vision, Otto Barkan, M.D., *American Journal of Ophthalmology*, November, 1936, published monthly by the Ophthalmic Publishing Company, St. Louis, Mo. To quote: "It is suggested that this operation, which restores the physiological function of Schlemm's canal, solves the surgical problem of most cases of chronic primary glaucoma. It is equally successful in certain cases of secondary glaucoma. The results are predictable and appear to be permanent. It involves a new principle in the surgery of glaucoma in that the angle of the anterior chamber and Schlemm's canal are under full view and magnified during the operation. The operation is without danger when the proper technique is used and has proved completely successful in the writer's hands when certain preoperative indications (binocular biomicroscopic diagnosis) have been fulfilled."

Visual Tasks in Sight-Saving Classes, Matthew Luckiesh, Ph.D., and Frank K. Moss, Ph.D., *American Journal of Ophthalmology*, November, 1936, published monthly by the Ophthalmic Publishing Company, St. Louis, Mo. This article is based upon an investiga-

tion of "72 pupils in the seventh, eighth, and ninth grades of sight-saving classes located in four different schools. Ten adult subjects possessing normal or near-normal vision were also used in order to permit the appraisal of the results obtained upon an absolute basis as well as upon a relative one. Type size, as a factor in seeing, was appraised by visibility measurements made with the Luckiesh-Moss Ophthalmic Sensitometer."

The Relationship of Eye Defects to School Failures, George L. King, Jr., M.D., and Dorothea Keplinger, M.A., *The Ohio State Medical Journal*, April, 1936, published monthly by the Ohio State Medical Association, Columbus, Ohio.

The authors state that this study has led to the following convictions: "Every failing child should have a complete physical examination including refraction under cycloplegic before being returned to the educational system," and "A proper approach to the failure problem can be achieved only by close co-operation between physicians and educators. By this cooperation only can the appalling record of failures be improved upon to the benefit of the child and of society in general."

The Diagnosis and Treatment of the Ocular Complications of Syphilis, Wm. M. James, M.D., *The Journal of the Missouri State Medical Association*, June, 1936, published monthly by the Missouri State Medical Association, St. Louis, Mo. Four conclusions are reached in this paper, as follows: "(1) Blindness due to syphilis can be eradicated by the early recognition and adequate treatment of syphilis; (2) Treatment of the infiltrative localized eye lesion is very successful; (3) The treatment of optic nerve atrophy is often delayed so long that useful vision has been lost before therapy has been instituted; (4) In about 50 per cent of the cases of optic nerve atrophy, seen early and carefully treated, good vision can be maintained indefinitely."

Book Reviews

THE AMBLYOPIA READER: A SYSTEM OF EYESIGHT DEVELOPMENT. Foreword and notes by Margaret Dobson, M.D., London: Theodore Hamblin Ltd., 1935, 94 p. ill. (New York: American Optical Co.)

The Dobson *Amblyopia Reader* is an excellent, rather de luxe sample of material badly needed in the treatment of squint amblyopia. The chief deterrent to the publication of much more similar material is its cost, and since this must be kept low because of the great amount required in any individual case, there will always be a limited supply of well presented books.

The book consists of 93 pages printed in two colors—red and black—with a preface outlining the theory and practice of the treatment. Essentially a red filter is used before the sound eye, which makes it impossible for this eye to distinguish the characters or lines printed in red and hence forces the amblyopic eye into this task. The idea is a good one and fits in with standardized practice in treating functional amblyopia. The chief drawback to the book is the choice of material. Eighty of the 93 pages consist of nursery rhymes familiar to many children and therefore susceptible to recitation rather than reading. It would be preferable to have unfamiliar, even incoherent material utilized for this work because: (1) It would be more difficult to memorize and so the value of the book in any individual case would be prolonged; and (2) It would reduce the possibilities of guessing what the next word will be.

Dr. Dobson has made a valuable contribution to amblyopia therapy. It is to be hoped that a greater abundance of such material can be made available at a not prohibitive cost.

LEGRAND H. HARDY, M.D.

TURNING NIGHT INTO DAY, THE STORY OF LIGHTING. M. Ilin, Philadelphia: J. B. Lippincott Co., 1936, 120 p. ill.

This book gives a picture of early and later methods (Russian) of lighting the home. One of the interesting points brought out

in this study of lighting is that although certain discoveries and inventions are attributed to definite persons, often people in many countries were working along similar lines and, in several instances, contributed something to the final discovery or product.

The illustrations are indicative of Russian life, but, with a few exceptions, they are not sufficiently clear to give much help in interpreting the various phases in the development of illumination.

The book has an excellent summary.

WINIFRED HATHAWAY

Briefer Comment

THE CANADIAN NATIONAL INSTITUTE FOR THE BLIND ANNUAL REPORT, Year Ending March 31, 1936. Toronto, Ontario. 88 p. ill.

This report is inspiring in its presentation of the wide scope of activities of the Canadian National Institute for the Blind. Of special interest to those concerned with saving sight are the report of the registration of the blind of Canada and review of each case; the description of the work being carried on against trachoma among the Indians; and the chairmen's reports of the various divisions of the Institute on the prevention of blindness activities, which include examination and treatment, provision of glasses, distribution of pamphlets and posters, and lectures.

SPEAKING FOR SAFETY. Chicago: National Safety Council, 1936, 74 p.

In this pamphlet the National Safety Council has issued "a handbook for the safety speaker," which contains "facts and figures, suggestions and a wealth of information of practical use in preparing the address." Accident prevention agencies are listed, as well as literature, posters, and film and other services available from the Council. In addition, a bibliography is given of selected references on general accident prevention and on public speaking. The pamphlet does indeed contain a "wealth of information" and should prove of value not only to the speaker on safety but to anyone interested in preventing accidents in industry, on the streets, at school and in the home.

EXOPHTHALMIC GOITER AND ITS MEDICAL TREATMENT. Israel Bram, M.D. St. Louis: The C. V. Mosby Company, 1936. 456 p. ill.

Of interest to oculists especially is the chapter on "Eye Symptoms in Exophthalmic Goiter," covering a section of 26 pages.

Books Received

HAYNES, WILLIAMS: *Men, Money and Molecules.* 216 p. ill. Doubleday, Doran & Company, Inc.

PEEK, GEORGE N., WITH SAMUEL CROWTHER: *Why Quit Our Own.* 356 p. D. Van Nostrand Company, Inc.

POUND, ARTHUR: *Industrial America: Its Way of Work and Thought.* 236 p. ill. Little, Brown and Company.

Current Publications on Sight Conservation

Note.—The National Society for the Prevention of Blindness presents the most recent additions to its stock of publications. Except for the more expensive ones, single copies are sent free upon request. Unless otherwise specified, they are reprinted from THE SIGHT-SAVING REVIEW. New publications will be announced quarterly.

217. Choral Speaking—An Aid in the Sight-Saving Class, Helen A. Anthony. 12 p. 10 cts. Reprinted from the *Sight-Saving Class Exchange*, Number 58, November, 1936.

218. Guarding the Sight of School Children, Edward Jackson, M.D. 12 p. 10 cts. For the majority of people in this and other civilized countries, the activities of the years of school life constitute the greatest stress and danger to sight they ever encounter.

219. The Management of Industrial Eye Injuries in their Relation to the Workmen's Compensation Laws, Elbert S. Sherman, M.D. 12 p. 10 cts. The compensation laws have been largely responsible for the creation of the new medical specialty: industrial or traumatic surgery, in which ophthalmology plays an important part.

220. Variations in Visual Acuity Among College Students, Ruth E. Boynton, M.D. 12 p. 10 cts. The author presents results of an analysis of the visual acuity among a thousand college students—comparing their visual acuity at enrollment with the visual acuity at graduation.

221. Congenital and Hereditary Diseases of the Eye, E. Clifford Place, M.D. 12 p. 10 cts. Congenital and hereditary diseases account for about one half of all blindness: many of these diseases could be reduced through intelligent medical and public co-operation.

222. Conservation of Vision—Infant and Preschool Age, Albert Frost, M.D. 12 p. 10 cts. The author emphasizes the need of thorough medical eye care in children before they reach school age, especially in such cases as cross-eyes and congenital cataracts.

223. Progress in the Use and Application of Photo-Electric Cell Control, Aksel J. C. Knudstrup. 4 p. 5 cts. The use of the photo-electric cell in controlling lighting in schoolrooms is an innovation which promises much practical application.

224. What the Community Should Know About Failing Vision, Arthur J. Bedell, M.D. 8 p. 5 cts. The author urges an aggressive campaign for the prevention of ocular disease by its early recognition and efficient treatment, with an urgent insistence that those who need glasses wear them to preserve their sight.

225. Play Activities for the Visually Handicapped Child, Ruth Abernathy. 8 p. 5 cts. A pro-

gram is outlined for the physical education teacher who must learn from the sight-saving class teacher the guideposts that are a part of the sight-saving philosophy.

226. Throw Away Your Glasses, W. H. Crisp, M.D. 12 p. 5 cts. Editorial reprinted from *American Journal of Ophthalmology*, pointing out the misunderstandings of quacks and prejudiced patients; exposes the fallacies of the "Bates' Method."

D93. Lighting the Lamp of Learning, Winifred Hathaway. Reprinted from *Progressive Education*, January, 1937. 6 p. ill. 5 cts. The author gives specifications for adequate light in the classroom under all conditions, necessary to protect the sight which is the real lamp of learning.

D94. Surrounding Eyes with Safety, J. W. Beall. Reprinted from *Safety Engineering*, December, 1936. 2 p. ill. 5 cts. Quoting from tables of statistics showing the history of eye accidents in Ohio industries over a period of ten years, the author explains why safety is better than compensation.

D95. Food in Relation to the Eyes, Park Lewis, M.D. Reprinted from *American Journal of Nursing*, January, 1937. 8 p. 5 cts. Discussion of diet in relation to the eyes, with special reference to vitamin deficiencies.

Contributors to This Issue

Interested in many different phases of sight conservation, **Dr. Edward Jackson** is active both as Chairman of the American Committee on Optics and Visual Physiology and as a Consulting Editor of the *Amerian Journal of Ophthalmology.*

Dr. Elbert S. Sherman is a practicing ophthalmologist in Newark, N. J.

The Director of the Students' Health Service of the University of Minnesota, **Dr. Ruth E. Boynton,** is also Secretary-Treasurer of the American Student Health Association.

Dr. E. Clifford Place is a member of the Brooklyn Ophthalmology Society and an active ophthalmologist in Brooklyn, N. Y.

A professor at Ohio State University, **Dr. Albert Frost** is Chairman of the Department of Ophthalmology there.

Aksel J. C. Knudstrup is an illuminating engineer with the Governmental Service Bureau at the Potomac Electric Power Company in Washington, D. C.

Book reviewers: **Dr. LeGrand H. Hardy** is in charge of the eye service at the Fifth Avenue Hospital in New York City, and **Winifred Hathaway** is an associate director of the National Society for the Prevention of Blindness.

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